1968

An Experimental Study Of The Teaching Of Certain Critical Thinking Skills to Ninth Grade Pupils

Dale Eugene Lee Fisher
University of the Pacific

AN EXPERIMENTAL STUDY OF THE TEACHING OF CERTAIN CRITICAL THINKING SKILLS TO NINTH GRADE PUPILS

A Dissertation
Presented to
the Faculty of the Graduate School
University of the Pacific

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

---

by
Dale Eugene Lee Fisher
June 1968

AN EXPERIMENTAL STUDY OF THE TEACHING OF CERTAIN CRITICAL THINKING SKILLS TO NINTH GRADE PUPILS

ABSTRACT OF DISSERTATION

The purpose of this study was to collect data from the controlled experiment that would add to the existing information concerning the improvement of the critical thinking skills of ninth grade pupils. The specific purposes of the study were: (1) to determine whether planned instruction in fact and opinion differentiation makes a statistically significant difference in a ninth-grader's general critical thinking ability; and (2) to determine the relation between a ninth-grader's gain in critical thinking ability and his level of intelligence, reading ability, socio-economic status, and his sex.

Study Design

The population for this study was made up of 336 students in fourteen ninth grade English classes in three junior high schools in Santa Rosa, California. The classes were divided into seven matched pairs on the basis of the pupil scores on the Watson-Glaser Critical Thinking Appraisal.

While the seven control classes continued their regular program of English instruction, the seven experimental classes were given special instruction by their regular teachers. This instruction was based on teacher's guides and pupil worksheets that were developed by the researcher for this study. The instructional materials related to the differentiation between statements of fact and statements of opinion, and to an understanding of various kinds of facts and opinions.

Following the eight-week instructional period, the Watson-Glaser Critical Thinking Appraisal was again administered to the pupils in both the control and experimental groups. The pre- and post-test pupil scores constituted the data of this experiment.

Findings

1. A statistical analysis of the data revealed that planned instruction in a specific critical thinking ability, fact and opinion differentiation, does make a statistically significant difference in a ninth-grader's general critical thinking ability.

2. The pupil gains in critical thinking ability were not significantly related to the pupil's level of intelligence, reading ability, or socio-economic status, nor to his sex.

If our schools turn out their pupils in that attitude of mind which is conducive to good judgment in any department of affairs in which the pupils are placed, they have done more than if they sent out their pupils possessed merely of vast stores of information or high degrees of skill in specialized branches.

John Dewey

ACKNOWLEDGEMENTS

The writer would like to express his deep and sincere gratitude to Dr. Dewey W. Chambers for his wise, generous counsel and helpful, creative advice throughout the preparation of this dissertation. Dr. Chambers' genuine interest and constructive criticism were always conveyed with genteelness and supportive enthusiasm, and will be warmly remembered by this writer.

Thanks and appreciation are also extended to the other members of the Dissertation Committee for their professional counsel and valuable support in the planning and reporting of this study. They are: Dr. Lloyd H. King, Dr. John V. Schippers, Dr. Robert W. Blaney, and Dr. Paul Witherington.

Grateful thanks are also extended to the faculty and staff members of the University of the Pacific for their kindly interest and friendship which helped along the way.

Personal mention of the writer's wife is in order. Her inspiration, encouragement, and continued confidence were initially motivating and provided a constant source of support at all times.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

I. INTRODUCTION

In early publications on the purpose of education in a free society, the Educational Policies Commission,[1] the Harvard Faculty Committee,[2] and the American Council on Education[3] indicated that a democracy requires that the development of the ability to think be a major goal of education.

To participate effectively and intelligently in the functionings of a democracy, an individual must be able to make sound judgments, wise choices, and correct appraisals. The individual, in addition to being affected with cultural customs and traditional habits, is constantly being bombarded with verbal and written communication that attempts to influence his judgments, choices, and appraisals. To cope with these influences, the individual must be able to carefully consider the evidence and base his choices and

---

[1] Educational Policies Commission, The Purpose of Education in American Democracy (Washington, D. C.: National Education Association, 1938), p. 157.

[2] Harvard Faculty Committee, General Education in a Free Society (Cambridge: Harvard University Press, 1946), p. 267.

[3] American Council on Education, Committee on a Design for General Education, A Design for General Education: American Council on Education Studies (Washington, D. C.: American Council on Education, 1944), p. 3.

actions on understandings which he himself achieves and on values which he examines for himself.

To achieve the above objective, an individual must be capable of critical thinking. This was emphasized by the President's Commission on Higher Education[4] in 1947 which stated:

> Development of the reasoning faculty, of the habit of critical appraisal, should be the constant and pervasive aim of all education, in every field and at every level.

In a publication on the objectives of education in a free society, the Educational Policies Commission[5] in 1961 also identified the development of the ability to think for oneself as a central purpose of American education and emphasized the need for specific action on the part of the schools. In this regard, they said:

> Many agencies contribute to achieving educational objectives, but this particular objective will not be generally attained unless the school focuses on it. In this context, therefore, the development of every student's rational powers must be recognized as centrally important.

This emphasis by the various commissions and committees charged with the development of goals for education has been reinforced by recent interest and by

---

[4]Higher Education for American Democracy, "Establishing the Goals," President's Commission of Higher Education (Washington: U.S. Gov't Printing Office, 1947), pp. 57-58.

[5]Educational Policies Commission, The Central Purpose of American Education (Washington: National Education Association, 1961), p. 12.

research in the area of children's thinking. The work of Piaget[6] with regard to concept development in children has brought forth disagreement[7] and considerable support.[8,9] Flavell[10] and Berlyne[11] have given helpful summaries of Piaget's research. Most of the work of Piaget and of those who follow him relates to the concepts of the physical world, but it also tends to indicate that readiness for abstract ideas is developed slowly and it comes through many concrete experiences. In A Study of Thinking, Bruner, Goodnow, and Austin[12] found it essential to understand the strategies of concept attainment because we think with concepts and attaining concepts is thinking.

---

[6]J. Piaget, The Language and Thought of the Child (New York: The Humanistic Press, Inc., 3rd ed., 1959).

[7]B. W. Estes, "Some Mathematical and Logical Concepts in Children," Journal of Genetic Psychology, LXXXVIII (March, 1956), 219-222.

[8]M. D. S. Braine, "The Ontogeny of Certain Logical Operations: Piaget's Formulation Examined by Nonverbal Methods," Psychological Monographs, LXXIII, No. 5, 1959.

[9]D. Elkind, "The Development of Quantitative Thinking: A Systematic Replication of Piaget's Studies," Journal of Genetic Psychology, XCVIII (June, 1961), 219-227.

[10]J. H. Flavell, The Developmental Psychology of Jean Piaget (Princeton: Van Nostrand Press, 1962).

[11]D. E. Berlyne, "Recent Developments in Piaget's Work," British Journal of Educational Psychology, XXVII (February, 1957), 1-12.

[12]J. S. Bruner, J. J. Goodnow, and G. Austin, A Study of Thinking (New York: Wiley and Sons, 1956).

Attention also has been given to some of the variables that influence the rate of development and the quality of performance with regard to thinking. Siller[13] found that the socio-economic variables are of definite importance in the development of children's thinking. Osler and Fivel[14] indicated the importance of intelligence and concluded that insightful strategy appears to emerge between about 10 and 14 years of age. Some helpful work in relation to the effect of motivation on the performance of older students has recently been done by McKeachie[15] and by Spielberger.[16]

The emphasis on thinking, and, more particularly, on concept formation as thinking has led to the conviction that methods of teaching oriented towards discovery, rather than mere practice, chould be employed. Suchman's

---

[13]J. Siller, "Socio-economic Status and Conceptual Thinking," Journal of Abnormal and Social Psychology, LV (October, 1957), 365-371.

[14]S. F. Osler and M. W. Fivel, "Concept Attainment: I. The Role of Age and Intelligence in Concept Attainment by Induction," Journal of Experimental Psychology, LXII (January, 1961), 1-8.

[15]W. J. McKeachie, "Motivation, Teaching Methods, and College Learning," Nebraska Symposium on Motivation (Lincoln, Nebraska: University of Nebraska Press, 1961), pp. 111-142.

[16]C. D. Spielberger, "The Effect of Manifest Anxiety on the Academic Achievements of College Students," Mental Hygiene, XLVI (July, 1962), 420-426.

Inquiry Training Research[17] focused on this point of view. He concluded that pupils should be encouraged to question, relate to, criticize, and restructure information in the light of their own cognitive styles. Taba[18] reported a study of thinking in elementary school children showing significant positive correlation between levels of thought and the degree of participation. Promising work has been done in the development of the methods of questioning and use of the discovery method in the teaching of science. Karplus[19] has described teaching procedures to get children to look at their environment in new ways. Schwab and Brandwein[20] have outlined inquiry strategies in the teaching of science.

Recent studies, more directly related to critical thinking, have been done by Ennis,[21] in the identification

---

[17]J. R. Suchman, "The Child and the Inquiry Process," Intellectual Development: Another Look. A. Passow, ed., (Washington: Association for Supervision and Curriculum Development, 1964).

[18]Hilda Taba, Thinking in Elementary School Children (U. S. Office of Education Cooperation Research Project 1574, San Francisco: San Francisco State College Press, 1964).

[19]R. Karplus, "Meet Mr. O," Science and Children, I (November, 1963), 19-24.

[20]J. J. Schwab and Paul Brandwein, The Teaching of Science (Cambridge: Harvard University Press, 1962).

[21]R. H. Ennis, "A Concept of Critical Thinking," Harvard Educational Review, XXXII (Winter, 1962), 82-84.

of the various aspects of critical thinking, and Smith,[22] in the area of eleventh and twelfth grade science. Creutz and Gezi[23] dealt with critical thinking and current events at the ninth and tenth grade levels, and Wallen, Haubrich, and Reid[24] made various curriculum modifications in eleventh grade history classes designed to foster critical thinking.

In his introduction, the researcher has pointed out (1) that the development of the ability to think has been advocated and accepted as a major goal of American education; (2) that the purposeful use of this ability to think and to think critically is required of the participants in a free, democratic society; (3) that the development of this ability should be a constant and pervasive aim of education; (4) that the school should make every effort to focus on this task; and (5) that there has been considerable interest and research in this regard.

---

[22]Paul M. Smith, Jr., "Critical Thinking and the Science Intangibles," Science Education, XLVII (October, 1963), 405-408.

[23]Gloria R. Creutz and Kalil I. Gezi, "Developing Critical Thinking in the Current Events Class," Journal of Educational Research, LVIII (April, 1965), 366-368.

[24]Norman E. Wallen, Vernon F. Haubrich, and Ian E. Reid, "The Outcomes of Curriculum Modifications Designed to Foster Critical Thinking," Journal of Educational Research, LVI (July-August, 1963), 529-535.

II. THE PROBLEM

Statement of the Problem

The purpose of this study was to conduct and report on a controlled experiment relating to the instruction of ninth-graders in certain critical thinking skills.[25]

It was anticipated that this experimental study would yield data that would answer the following questions:

1. Does planned instruction in a limited range of critical thinking skills make a statistically significant difference in a ninth-grader's general critical thinking ability, when compared with the effect of incidental instruction in these skills as measured by the Watson-Glaser Critical Thinking Appraisal?[26]

2. What is the relation between a ninth-grader's ability with regard to these critical thinking skills and his intelligence?[27]

3. What is the relation between a pupil's facility with regard to these critical thinking skills and his reading level?[27]

4. What is the relation between a pupil's ability with regard to these critical thinking skills and his socio-economic level?[27]

5. What is the relation between a pupil's ability with regard to these critical thinking skills and his sex?[27]

---

[25] See the definition of terms for the meaning of this phrase as used throughout the dissertation.

[26] Goodwin Watson and Edward Glaser, Watson-Glaser Critical Thinking Appraisal (New York: Harcourt, Brace and World, inc., 1964).

[27] See the definition of terms for the measure to be used in this study.

Significance of the Study

Educators have long been concerned with the improvement of critical thinking abilities and/or skills and with the need for more research in this area.[27] This study is significant in that it contributes to the information related to the improvement of a basic aspect of critical thinking.

The study was concerned with "the process of correctly assessing statements," a definition of critical thinking given by Ennis.[28] It was an evaluation of the planned instruction of ninth-graders with regard to the distinguishing between statements of fact and statements of opinion. This instruction also provided opportunity to recognize and differentiate among the various kinds of facts[29] and the various kinds of opinions.

An important aspect of this study was the value that accrued to the participating pupils through the learnings involved in the instructional aspects of the experiment. Also, it is hoped that these learnings may well provide a base for the further development of their critical thinking abilities.

---

[27] R. H. Ennis, "Needed: Research in Critical Thinking," Educational Leadership, XXI (October, 1963), 17-20.

[28] Ibid., p. 17.

[29] See the section on the definition of terms for a delineation of the meaning of the terms "kinds of facts" and "kinds of opinions".

III. PURPOSES OF THE STUDY

It was the purpose of this study to collect data from the controlled experiment that would add to the existing information concerning the improvement of the critical thinking skills of ninth grade pupils. More specifically, the researcher's purposes were:

1. To determine whether planned instruction in the selected critical thinking skills could be done with a significant degree of success. This involved the determination of whether or not there was a significant difference between the means of the experimental and the control groups after instruction. The measuring instrument was the Watson-Glaser Critical Thinking Appraisal.

2. To determine whether there was a significant difference between the gains made by the boys and those made by the girls in the experimental classes.

3. To determine whether there was a significant difference among the gains made by the various socio-economic levels represented in the experimental classes.

4. To determine whether there was a significant difference among the gains made by the various levels of reading ability represented in the experimental classes.

5. To determine whether there was a significant difference among the gains made by the various levels of intelligence represented in the experimental classes.

Because of the need to deal with skills that could be developed at the junior high school level, one of the three important critical thinking abilities suggested by

Devine[30] and Burton[31] was selected. It was the ability to distinguish fact from opinion. Teacher's guides and worksheets for the pupils were developed by the investigator to facilitate and unify instruction in this ability.

The population for the experiment was made up of 336 thirteen and fourteen-year old boys and girls in fourteen ninth grade English classes in three junior high schools of the Santa Rosa High School District, Santa Rosa, California.

Prior to the eight-week instructional period, the pupils in the fourteen classes took the Watson-Glaser Critical Thinking Appraisal[32] and, on the basis of their scores on this test, were divided into pairs of classes with near-comparable means and variances. In addition to their customary English instruction, the experimental group classes were given special instruction by their regular teachers using the guides and worksheets developed for the study. The classes in the control group continued their regular program of English instruction.

Following the eight weeks of instruction, the Critical

---

[30]T. G. Devine, "Critical Thinking in the English Class," Peabody Journal of Education, XXXIX (May, 1962), 359-365.

[31]W. H. Burton, R. B. Kimball, and R. L. Wing, Education for Effective Thinking (New York: Appleton-Century, Crofts, 1960), pp. 74-122.

[32]Goodwin Watson and Edward M. Glaser, Watson-Glaser Critical Thinking Appraisal (New York: Harcourt, Brace and World, Inc., 1964).

Thinking Appraisal was again administered to the classes of the control and experimental groups. The treatment of this post-test data yielded the answers to the questions constituting the dissertation problem.

IV. ASSUMPTIONS AND LIMITATIONS

The assumptions upon which this study was based follow:

Assumptions

1. A major aim of education is to produce persons with a well-developed ability for judgment.[33]
2. Facility in recognizing and differentiating the various kinds of statements is a desirable and necessary skill in a free, democratic society[34] since, as Kemp[35] indicates, the quality of our thinking will determine our existence as a free people.
3. The ability to distinguish between statements of fact and statements of opinion is a skill that can be taught.[36]
4. There are various kinds of facts and various kinds of opinions and the ability to differentiate among

---

[33] R. T. Fisher, "What Knowledge is of the Greatest Worth?" Education, LXXXIII (January, 1963), 304-305.

[34] Paul L. Dressel, "Critical Thinking," National Education Association Journal, XLI (October, 1955), 418-420.

[35] C. G. Kemp, "Improvement of Critical Thinking in Relation to Open-Closed Belief Systems," Journal of Experimental Education, XXXI (March, 1963), 321-323.

[36] Devine, op. cit., p. 363.

them can be taught.[37]

5. Children will have varying degrees of facility with regard to these skills and the development of the skills will take place at different rates. This can be noted and evaluated by means of a test instrument.

6. The Watson-Glaser Critical Thinking Appraisal will be a proper evaluating instrument for the purposes of this study. This test was suggested by the Major Advisor upon the recommendation of the Chairman of the Educational Psychology Department of the University.

7. The classification of the kinds of facts and the kinds of opinions (see definition of terms) was based on the definitions of fact and opinion given by Webster's Third New International Dictionary.[38]

8. Transfer of learning to other subject areas will take place, but in what way and to what extent will not be the concern of this study.

This investigation was also based upon certain limitations which follow:

Limitations

1. Those established by the selection of the specific critical thinking abilities that relate to (1) the distinguishing between fact and opinion, and (2) the differentiating among the various kinds of facts and the various kinds of opinions.

2. Those set by the inability to obtain truly comparable groups for control and experimental purposes. The classes were divided on the basis of their initial scores on the Watson-Glaser Critical Thinking Appraisal into pairs with near-comparable means and variances.

---

[37] Burton, Kimball, and Wing, op. cit., pp. 74-122.

[38] Webster's Third New International Dictionary (Springfield, Mass.: G. and C. Merriam Company, Publishers, 1966).

3. Those created by the decision to have two periods a week for eight weeks constitute the instructional period.

4. Those created by the quality and character of the lesson units which were prepared by the investigator to facilitate and unify the instruction in fact and opinion differentiation.

5. Those set by the degree of ability of the researcher to bring about and maintain the desired cooperation on the part of the participating teachers.

6. Those created by the teachers' use of the prepared guides as determined by their backgrounds, abilities, and enthusiasm.

7. Those affected by the attitudes of the pupils in the experimental classes, their enthusiasm, and their openness to instruction in the selected critical thinking abilities.

8. Those resulting from the Hawthorne Effect in the case of both the teachers and the pupils in the experimental classes.

9. Those set by the degree of reliability (.85) of the evaluating instrument.

V. DEFINITIONS OF TERMS USED

The following definitions of terms will be used in this study:

1. Critical Thinking: "Thinking that proceeds on the basis of careful evaluation of premises and evidence and comes to conclusions as objectively as possible through the consideration of all pertinent factors."[39]

---

[39]Carter V. Good, ed., Dictionary of Education (New York: McGraw-Hill Book Company, Inc., 1959), p. 570.

2. Certain Critical Thinking Skills: The skills that relate to the ability to determine whether a statement is an expression of fact or opinion and to decide what kind of a fact or what kind of an opinion is being expressed. (see 3, 4, 5, and 6 following)

3. Fact: A statement of: "(1) an occurence, quality, or relation which is manifest in experience or may be inferred with a high degree of certainty; (2) something which has been verified; and (3) something personally known through an awareness of physical actuality or practical experience."[40]

4. Kinds of Facts: A statement determined to be a fact may be further classified into one of the following categories:

   a. Something known to be a fact through one's own experience.

   b. A statement accepted as a fact because it was made by one whom most knowledgeable people recognize as an authority.

   c. A statement regarding an historical fact.

   d. An historical tale that may or may not be true.

   e. An untruth that some people tell or report as being a fact.

5. Opinion: "A statement that is not demonstrable as fact and refers to a view, judgment, or appraisal formed in the mind about a particular matter, including: (1) a notion or conviction founded on probable evidence; (2) a belief or view based on interpretation of observed facts and experience; (3) something that is generally accepted as factual; and (4) a formal expression by an expert."[41]

---

[40] Webster's Third New International Dictionary. p. 813.

[41] Ibid., p. 1582.

6. Kinds of Opinions: A statement determined to be an opinion may be further classified into one of the following categories:

   a. An expert opinion - one with which very few knowledgeable people would disagree.

   b. A respected opinion - one with which a few knowledgeable people would disagree but with which most knowledgeable people would agree. (see (3) under "opinion")

   c. An accepted opinion - one with which many agree but with which many would also disagree. (see (2) under "opinion")

   d. A subjective opinion - one with which very few people would agree but one with which knowledgeable people would recognize as being of value to the one holding this opinion. (e.g. "My Mother is the finest in the world.")

   e. A doubtful opinion - one with which very few people would agree and with which all others would disagree.

7. Teacher's Guides: A set of fifteen lessons prepared by the researcher for the use of the teachers of the experimental classes. The guides related to the development of the selected critical thinking abilities and contained suggestions for lesson preparation, pupil motivation, instructional methodology, and pupil exercises. (see Appendixes A and B)

8. Planned Instruction: Instruction that is based on a planned program designed for a definite purpose and involving specific learnings for pupil mastery.

9. Incidental Instruction: Instruction in a particular subject or skill that arises spontaneously out of the instructional experiences that were planned to relate to a different subject or to a different skill.

10. Intelligence: "The available ability as measured by intelligence tests to use one's existing knowledge to meet new situations and to solve new problems, to learn, to foresee problems, to use symbols and/or relationships, and to think

abstractly."[42] For the purpose of this study, the California Test of Mental Maturity[43] will be used as the measuring instrument.

11. Reading Ability: "The ability to bring meaning to the printed page"[44] or "to construct ideas out of one's own experience in response to a printed stimulus."[45] In this study, reading ability will be stated in terms of grade-level scores as determined by the pupils' scores on the reading section of the California Achievement Test.[46]

12. Socio-economic Level: The status in a particular society derived from a combination of social and economic factors relating to income and to social position considered as a single factor.[47] For this study, the occupation of the pupil's father will be used as the determinant of this status. Warner[48] indicates that the socio-economic level of a family highly correlates (.91) with the father's occupation.

13. Significant Difference: "A difference whose probability of its occurrence through chance alone is less than the designated significance level thus permitting the rejection of a null

---

[42] Ibid., p. 1174.

[43] W. W. Clark, E. T. Sullivan, and E. W. Tiegs, California Test of Mental Maturity (Sacramento: California Test Bureau, 1959).

[44] Henry P. Smith and Emerald V. Dechant, Psychology in Teaching Reading (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961), p. 22.

[45] Ernest Horn, Methods of Instruction in the Social Studies (New York: Charles Scribner's and Sons, 1937), p. 154.

[46] W. W. Clark and E. W. Tiegs, California Achievement Test (Sacramento: California Test Bureau, 1959).

[47] Webster's Third New International Dictionary. p. 2163.

[48] W. L. Warner, M. Meeker, and K. Ellis, Social Class in America (Chicago: Science Research Associates, 1949), pp. 139-141.

hypothesis."[49]

14. Level of Significance: The selected level of significance for this study is .05.

15. Null Hypothesis: "The hypothesis that two or more treatments are equally effective."[50] In this study, the null hypothesis is that planned instruction in the selected critical thinking ability and incidental instruction in this ability are equally effective.

VI. SUMMARY

The first chapter of this report has given an introduction to the dissertation, stated the problem, specified the significance of the study, outlined the assumptions and the limitations upon which the research is based, and has defined the important terms used in the chapter and in the report of the study.

Four additional chapters complete the remainder of the study. They are as follows: (1) Chapter II: Review of the Literature Related to this Study; (2) Chapter III: Description of the Design and Procedure of the Study; (3) Chapter IV: Presentation of the Collected Data and its Statistical Treatment; and (4) Chapter V: Conclusions Based Upon the Investigation and Recommendations for Further Study.

---

[49] Good, op. cit., p. 172.

[50] Ibid., p. 277.

CHAPTER II

REVIEW OF THE LITERATURE RELATED TO THIS STUDY

The literature pertinent to this study was reviewed with regard to two major areas: (1) that which related to the various attempts to arrive at an understanding of the nature of critical thinking; and (2) the research that has been conducted relating to the improvement of critical thinking skills.

I. THE NATURE OF CRITICAL THINKING

The investigator found that there is often a vagueness in the literature concerning what is actually meant when the term "critical thinking" is used. Such terms as "logical thinking," "reflective thinking," "scientific thinking," "clear thinking," "autonomous thinking," "correct thinking," "judgmental thinking," "straight thinking," and "rational thinking" are frequently used interchangeably and synonomously for critical thinking as defined in Chapter I. This interchanging of terms arises because of the complexity and scope of the critical thinking process. When a detailed study of critical thinking is attempted, this complexity becomes apparent and the "book" definitions require further elaboration and precision. Those who have thought seriously about critical thinking have

made various attempts to arrive at more precise understandings of its nature. These attempts at delineation and definition reflect the point of view and emphasis of the particular writer and seem to fall into three major categories: (1) those whose opinions equate critical thinking with problem solving or reflective thinking; (2) those whose opinions reduce critical thinking to a process of logical or rational analysis of some type; and (3) those who see critical thinking as evaluation and examination.

Critical Thinking as Problem Solving

Those who view critical thinking as being closely akin to problem solving are in agreement with John Dewey and his classic definition in which he stated:

> Reflective thought consists of the active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends.[1]
>
> Reflective thinking, in distinction from other operations to which we apply the name of thought, involves (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring, to find material that will resolve the doubt, settle and dispose of the perplexity.[2]

---

[1] John Dewey, How We Think (Boston: D. C. Heath and Company, 1933), p. 9.

[2] Ibid., p. 12.

To impress his thinking unmistakably on those who wanted to develop this kind of thinking in young people, Dewey outlined his now-famous complete act of thought. The five steps[3] which intervene between the prereflective and the postreflective states are: (1) the felt difficulty; (2) an intellectualization of the difficulty into a problem to be solved; (3) the use of one suggestion or another as a leading idea, or hypothesis, to initiate observation and other operations in the collection of factual material; (4) the mental elaboration of the idea or supposition; and (5) testing the hypothesis by overt or imaginative action. Through the years, many other writers in this area have followed this model. For example, in defining critical thinking, Kemp[4] included such specific abilities as the ability to define a problem, select the pertinent information, recognize stated and unstated assumptions, formulate and select relevant and promising hypothesis, draw conclusions validly, and judge the validity of inferences. Mason[5] said that criticism enters

---

[3] Ibid., p. 107.

[4] C. G. Kemp, "Improvement of Critical Thinking in Relation to Open-Closed Belief Systems," Journal of Experimental Education, XXXI (March, 1963), pp. 321-323.

[5] S. Mason, "Essentials of Thinking," Baltimore Education, XVII (January, 1939), pp. 19-22.

into the realm of reasoning which he designated as problem solving. Wellington[6] lists five steps, quite similar to Dewey's, that he considers necessary in critical thinking.

In line with Dewey's emphasis on the "felt difficulty" as the primary cause of thinking, Wellington[7] indicates that "the arousal of anxiety is the pre-requisite to critical thinking." Bartlett[8] defines thinking as a gap-filling process since first there is an awareness of a gap, then comes interpolation, viewing evidence, and closing the gap. Suchman,[9] in his emphasis on inquiry, sees the awareness of a difficulty leading to relevant inquiry, with critical thinking becoming an important part of this problem-solving process. Referring to what is essentially problem solving, Downing[10] lists criteria to be used as safeguards for this scientific or critical thinking.

---

[6]C. B. Wellington, Teaching for Critical Thinking (New York: McGraw-Hill, Inc., 1960), p. 31

[7]Ibid., p. 116.

[8]F. E. Bartlett, Thinking: An Experimental And Social Study (New York: Basic Books, 1958), p. 5.

[9]J. R. Suchman, "The Child and the Inquiry Process," Intellectual Development: Another Look, A. Passow (ed.) (Washington D. C.: Association for Supervision and Curriculum Development, 1964), pp. 118-123.

[10]E. R. Downing, "The Elements and Safeguards of Scientific Thinking," The Scientific Monthly, XII (May, 1928), pp. 241-243.

Two leading exponents of this point of view are Hullfish and Smith who, in their text, Reflective Thinking: The Method of Education,[11] use reflective thinking and critical thinking interchangeably, and think of each term as essentially a problem-solving process.

For those who think of critical thinking as problem solving, there is a strong emphasis on the steps involved in solving a problem, but critical thinking is not as orderly, logical, and sequential as the formal steps imply. Dewey[12] himself warned that "two of them may telescope, some of them may be passed over hurriedly, and the burden of reaching a conclusion may fall mainly on a single phase, which will then require a seemingly disproportionate development. Also, critical thinking is not synonomous with scientific thinking nor does it involve the specific steps of scientific methodology. Many writers disagree with this emphasis on critical thinking as problem solving and insist that critical thinking is the detection and correction of errors in thought products through the application of the test of logical or rational consistency.

---

[11] H. Gordon Hullfish and P. G. Smith, Reflective Thinking: The Method of Education (New York: Dodd, Mead and Company, 1963).

[12] Dewey, op. cit., p. 116.

Critical Thinking as Logical or Rational Consistency

This approach to the understanding of the nature of critical thinking emphasizes the tools of critical thinking while recognizing the importance of a milieu conducive to the use of these tools. Haubrich[13] defined the principles of critical thought as "the rules which facilitate the detection and correction of errors in various types of argumentative forms." Similarly, Dressel[14] and Smith[15] used the terms critical thinking and logical reasoning as synonomous. In more specific terms, Smith[16] described it as "the kind of thinking which is explicitly concerned with language and logic," while without equating logic with formal logic, Glicksberg[17] agreed with Hyran[18] when he said:

> Thinking is critical when it is essentially logical...(and) logical thinking is no more than the application of the rules of logic to factual data to arrive at valid and true conclusions.

---

[13]Vernon Haubrich, "Some Problems in Critical Thinking," Progressive Education, XXXIV (March, 1957), p. 60.

[14]Paul L. Dressel, "Critical Thinking, The Goal of Education," National Education Association Journal, XLIV (October, 1955), pp. 418-420.

[15]B. O. Smith, "The Improvement of Critical Thinking," Progressive Education, XXX (March, 1953), pp. 129-34.

[16]Ibid., p. 130.

[17]C. I. Glicksberg, "Practical Logic in the Classroom," English Journal, XXXV (January, 1946), pp. 14-21.

[18]G. M. Hyran, "An Experiment in Developing Critical Thinking in Children," Journal of Experimental Education, XXVI (Winter, 1957), p. 126.

Piaget,[19] though not referring specifically to the term critical thinking, defined judgment in terms of formal logic. To him, rigorous deduction is the only acceptable reasoning, and unless the child acquired the need for demonstration and verification, and is able to internalize, reverse and coordinate the relations within each other and within the whole structure, he does not reason. Similarly, Jelinck[20] recognizes the importance of deductive reasoning in critical thinking when he says that "critical thinking is essentially a matter of interpreting facts, applying generalizations and recognizing errors in logic."

In defining the nature of evaluation, Guilford[21] said "the best established evaluation factor is that of logical evaluation" which he defined as "the ability to judge the soundness of conclusions where logical consistency is the criterion." Bloom[22] called this logical

---

[19]Jean Piaget, Judgment and Reasoning in the Child (New York: Harcourt, Brace and Company, 1928), p. 159.

[20]J. Jelinck, "Literature and the Development of Critical Thinking," Clearing House, XXX (May, 1956), p. 643.

[21]J. P. Guilford, "The Structure of Intellect," Psychological Bulletins, LIII (July, 1956), p. 282.

[22]B. S. Bloom, Taxonomy of Educational Objectives: Handbook I: Cognitive Domain (New York: Longman, Green and Company, 1956), p. 47.

evaluation factor "judgment based on internal evidence."

Black[23] entitles his book Critical Thinking, and then presents a text on logic. He maintains that critical thinking is a certain kind of reasoning that is based on the art and science of logic. The text contains suggestions for the practice of this art and science in the criticism of reasoning. Similarly, Johnson[24] considers critical thinking as "the use of logical reasoning and the avoidance of common fallacies in judgment," while Melzer[25] holds that critical thinking is the application of functional logic in statement assessment.

In an early study concerning the possibility of teaching critical thinking in the high school, Glaser[26] included in the term critical thinking "(1) an attitude of being disposed to consider in a thoughtful way the problems and the subjects that come within the range of one's experience, (2) the knowledge of the methods of logical inquiry and reasoning, and (3) some skill in

---

[23]Max Black, Critical Thinking (New York: Prentice-Hall, Inc., 1965), pp. 3-10.

[24]D. M. Johnson, The Psychology of Thought and Judgment (New York: Harper and Bros., 1955), p. 497.

[25]J. H. Melzer, "What is Functional Logic?" Peabody Journal of Education, XXX (January, 1952), p. 80.

[26]E. M. Glaser, "An Experiment in the Development of Critical Thinking," Teachers College Contribution to Education (New York: Columbia University Press, 1941), p. 6.

applying these methods." More recently, Wallen, Haubrich, and Reid[27] conducted a study with regard to some curriculum modifications designed to foster critical thinking, and by critical thinking they meant "the use of the correct principles of logic."

Taba[28] emphasizes a more general application of logical or rational consistency when she gives four tasks that are required of those who would think critically and arrive at "proof." These are: (1) learn to detect assumptions underlying a variety of arguments and learn to scrutinize their validity and acceptability; (2) learn to appraise the quality of evidence; (3) learn to recognize the role of definitions and acquire skill in determining the correct meaning of crucial terms and words; and (4) learn to isolate and examine the structure of the argumentation itself and determine whether or not it is logical.

This emphasis on the application of the standard of logical or rational consistency is certainly an important one and no thought product should be accepted that violates this standard. However, a statement may be correct

---

[27]Norman Wallen, V. F. Haubrich, and I. E. Reid, "The Outcomes of Curriculum Modifications Designed to Foster Critical Thinking," Journal of Educational Research, LVI (July-August, 1963), pp. 531-535.

[28]Hilda Taba, "What Is Proof," Educational Leadership, I (April, 1944), p. 394.

with regard to logic and yet, when viewed critically, found to be of little worth or value. The final point of view suggests that value judgments are an integral part of critical thinking. The writers who stress this define critical thinking as statement examination and evaluation.

Critical Thinking as Examination and Evaluation

When an individual engages in critical thinking, he does so on the basis of an awareness of a difficulty or problem and generally proceeds in an orderly fashion, as pointed out by those who identify critical thinking with problem solving. He certainly does all this in a reasonable manner, applying the test of functional logic to the object of his thought, as emphasized by those who equate critical thinking with logical or rational consistency. However, there are many who select a different emphasis and see critical thinking as the examination and evaluation of an existing product of thought. Burton and others[29] devote their text, Education For Effective Thinking, to this point of view and maintain that "critical thinking results when there is persistent effort to to examine the evidence which supports any belief, solu-

---

[29]W. H. Burton, R. B. Kimball, and R. L. Wing, Education For Effective Thinking (New York: Appleton-Century Crofts, 1960), pp. 2-4.

tion, or conclusion which is suggested for acceptance, together with the implications and further conclusions of the evidence." Metcalf[30] suggests that critical thinking is statement assessment, and Devine[31] emphasizes examination when he identifies three important critical thinking abilities as: (1) the ability to recognize inferences; (2) the ability to distinguish fact and opinion; and (3) the ability to recognize bias.

Smith[32] says that this examination and evaluation will result in the exposure of beliefs not supported by evidence, an awareness of ambiguous words, expression of bias, contradiction, and much more. He defines critical thinking in terms of the operations involved in the examination and evaluation of statements which we, or others may believe, i. e., the process of deciding whether a statement is dependable or not, and to what degree.

The judgmental aspect of critical thinking was

---

[30]Lawrence E. Metcalf, "The Reflective Teacher," Phi Delta Kappan, XLIV (October, 1962), pp. 17-21.

[31]T. G. Devine, "Critical Thinking in the English Class," Peabody Journal of Education, XXXIX (May, 1962), pp. 359-365.

[32]B. O. Smith, "Improvement in Critical Thinking," Progressive Education, XXX (March, 1953), pp. 129-134.

called "critical mindedness" by Freedman[33] and he defined critical thinking as "the ability to judge the merit or quality of something, from an idea or method, to a work of literature or an article of furniture." Symonds,[34] in his analysis of the thinking process, places critical thinking fourth in the hierarchy and calls it judgment, while Reitz[35] said that "judgment is the most important form of the higher mental processes." Continuing this emphasis on judgment, Dressel[36] says that critical thinking is "that reasoning which results in a value judgment," and DeBoer[37] suggests that the establishment of the criteria for this judgment of a statement or a product is one of the most important parts of critical thinking. A further emphasis on judgment is given by Ennis,[38] when he states that the basic notion of critical thinking is "the correct assessing of state-

---

[33] I. Freedman, "Developing Critical Mindedness," Clearing House, XXXI (February, 1956), p. 104.

[34] P. M. Symonds, Education and the Psychology of Thinking (New York: McGraw-Hill, 1936), pp. 183-197.

[35] W. Reitz, "Higher Mental Processes," Encyclopedia of Educational Research (New York: MacMillan Company, 1950), pp. 540-551.

[36] Dressell, op. cit., p. 418.

[37] J. J. DeBoer, "Teaching Critical Reading," Elementary English Review, XXIII (October, 1946), p. 251.

[38] Robert Ennis, "A Concept of Critical Thinking," Harvard Educational Review, XXXII (Winter, 1962), pp. 83, 84.

ments." He then lists twelve abilities which are used in this assessment. They are:

1. Grasping the meaning of a statement.
2. Judging whether certain statements contradict each other.
3. Judging whether there is ambiguity in a line of reasoning.
4. Judging whether a conclusion follows necessarily.
5. Judging whether a statement is specific enough.
6. Judging whether a statement is actually the application of a certain principle.
7. Judging whether an observation is reliable.
8. Judging whether an inductive conclusion is warranted.
9. Judging whether the problem has been identified.
10. Judging whether a statement of something is really an assumption.
11. Judging whether a definition is accurate and adequate.
12. Judging whether a statement made by an alledged authority is genuine and acceptable.

In his schema depicting the complete thinking process, Russell[39] lists critical thinking between problem solving and creative thinking. For him, critical thinking implies appraisal in terms of some norm, standard, or value. Evaluation of information, according to

---

[39]David H. Russell, Children's Thinking (Boston: Ginn and Company, 1956), pp. 10, 13.

Ferrell,[40] requires the testing of all informational evidence for reliability, relevancy, sufficiency, and interpretation. Henderson[41] stresses rating according to specific rules, when he says:

> The critical thinker evaluates what he is thinking about (the rating) by using implicitly or explicitly certain rules (criteria). These rules guide his observation and thought. He then rates the object of his thought, and justifies his rating by reasons.

Summarizing, for those who see critical thinking as examination and evaluation, Fawcett[42] outlined seven steps for the person who would engage in critical thinking. He stated that the critical thinker will:

1. Select the significant words and phrases in any statement that is important to him and ask that they be carefully defined.
2. Require evidence in support of any conclusion he is pressed to accept.
3. Analyze that evidence and distinguish between fact and opinion.
4. Recognize the statements that involve stated and/or unstated assumptions.

---

[40] F. H. Ferrell, "They Learn to Think for Themselves," Progressive Education, XXVI (October, 1948), p. 12.

[41] K. B. Henderson, "Teaching of Critical Thinking," Phi Delta Kappan, XXXIX (March, 1958), p. 280.

[42] H. P. Fawcett, "The Nature of Proof," Thirteenth Yearbook, National Council Teachers of Mathematics (New York: Teachers College, Columbia University, 1938), pp. 11, 12.

5. Evaluate these assumptions, accepting some and rejecting others.

6. Evaluate the argument, accepting or rejecting the conclusion.

7. Constantly re-examine the assumptions which are behind the writer's beliefs.

These seven steps, as well as the other viewpoints expressed in this section on "Critical Thinking as Examination and Evaluation," provide the emphasis and point of view on which this study was based. The devised instructional materials and teacher's guides (see Appendixes A and B) were developed with this emphasis in mind.

Critical thinking differs from problem solving, which is initiating and producing a product, and from the application of formal logic to a product of thought. Though critical thinking may certainly include some aspects of both problem solving and the tests for logical consistency, neither emphasis seems adequate when one wants to define or describe critical thinking. For this writer, critical thinking is the careful examination and evaluation of a product of thought. This examination and evaluation will result in a conscious judgment as to whether the statement is factual or not and also as to its importance or value. The judgment as to fact involves the application of the standard of rational consistency. The value judgment involves preference, interest, or obligations based on ethical considerations.

II. RESEARCH RELATED TO VARIOUS ASPECTS OF CRITICAL THINKING

The literature pertinent to this study revealed a considerable amount of research that dealt with the various aspects of critical thinking. This research relates to: (1) the development or improvement of the critical thinking abilities; (2) the factors that affect or relate to these abilities; and (3) the major studies that have been conducted with regard to critical thinking and its improvement.

Development of Critical Thinking Abilities

There have been numerous studies relating to the development of the critical thinking abilities. The preponderance of these research findings support the premise that critical thinking abilities can be developed or improved.

The research indicates that if critical thinking skills are to be improved, the instructional materials and the teaching methodology must be closely related to the skills and abilities involved in critical thinking. For example, Teichman,[43] in surveying the literature on

---

[43] L. Teichman, "The Ability of Science Students to Make Conclusions," Science Education, XXVIII (May, 1944), pp. 268-279.

critical thinking for his study, discovered that the findings of some of the studies disputed the importance of specific emphasis on scientific method in teaching procedures for the development of critical thinking. This may well have been due to the fact that instruction in the scientific method is too far removed from the abilities called for in critical thinking. Relating to this point, Fawcett[44] suggested that a lack of significant development in the critical thinking abilities might be due to the methods and materials used in the instruction. He found in a controlled teaching experiment that the usual formal course in demonstrative geometry did not improve the reflective thinking ability of the pupils. To develop critical thinking through geometry instruction, he suggested familiarizing students with the nature of proof as a method of thought. Similarly, Ulmer[45] tried in a controlled study to find out whether teaching geometry under normal conditions would culminate in reflective thinking. He concluded that:

> The results indicate that even what is commonly regarded as superior geometry teaching has little

---

[44] H. P. Fawcett, "Curricula Value of the Future," Progressive Education, XXXIII (January, 1956), pp. 1-44.

[45] G. Ulmer, "Teaching Geometry to Cultivate Reflective Thinking," Journal of Experimental Education, VIII (Fall, 1939), p. 25.

> effect upon pupils' behavior in the direction of reflective thinking unless definite provisions are made to study the methods of thinking as an important end in itself.

The following studies used specially prepared teaching materials and all found significant improvement in the critical thinking ability of the pupils in the experimental groups. Blair and Goodson,[46] as a result of their investigation with groups of ninth grade pupils, found a significant gain in critical thinking ability following a period of instruction using special learning exercises. They concluded:

> ...the study of general science does not, in and of itself, make a unique contribution to the development of the scientific attitude on the part of the ninth grade pupils. Marked improvement in scientific thinking, however, is secured through the general science course when special attention is given to obtaining this outcome and when special learning exercises of the type described in this paper are utilized.

Hyran[47] conducted a controlled experiment in which the experimental groups were given instruction that emphasized the principles of logic as the learning content. He found significant difference in the mean achievement

---

[46] G. M. Blair, and M. R. Goodson, "Development of Scientific Thinking Through General Science," School Review, XLVII (November, 1939), p. 701.

[47] G. M. Hyran, "An Experiment in Developing Critical Thinking in Children," Journal of Experimental Education, XXVI (Winter, 1957), p. 130.

of the control and experimental groups in final reasoning ability and so concluded that "upper grade pupils can be taught to think critically."

It has also been determined that critical thinking abilities can be developed at the elementary school level. As a result of testing the ability to use data in the fifth and sixth grades, Arnold[48] concluded that:

> Critical thinking can be taught in the elementary school whenever time is taken to give adequate consideration to our purposes and procedures.

Saadeh's[49] experiment with fifth and sixth grade pupils bears this out, while Grener and Raths[50] reported a significant difference in the thinking of third grade children in one semester as a result of special experiences planned by the investigators to develop this ability.

Jewett[51] found, that after training high school students to detect and analyze propaganda, that significant

---

[48] D. L. Arnold, "Testing Ability to Use Data in the Fifth and Sixth Grades," Education Research Bulletin, XVII (February, 1938), p. 78.

[49] I. Q. Saadeh, "An Evaluation of the Effectiveness of Teaching for Critical Thinking in the Fifth and Sixth Grades," (unpublished Doctoral dissertation, University of California, Berkeley, 1962), pp. 185-195.

[50] Norma Grener, and L. E. Raths, "Thinking in Grade Three," Educational Research Bulletin, XXIV (January, 1945), pp. 38-42.

[51] A. Jewett, "Detecting and Analyzing Propaganda," English Journal, XXIX (February, 1940), pp. 105-115.

improvements were made on a generalization test. His findings were confirmed by Furst[52] who found that all the critical thinking abilities in his devised test were amenable to instruction. These were: specialized knowledge, habitual approach to problems, judging validity of evidence, and application of principles. Likewise, Henderson[53] found that the planned teaching of the techniques of criticism and the principles of logic significantly improved a high school student's critical thinking ability.

To summarize the above, it can be said assuredly that there is research evidence substantiating the premise that the critical thinking abilities of students can be developed. The research indicates that (1) critical thinking must be taught specifically if significant improvement is to take place, and (2) improvement occurs most readily when instructional materials and procedures are designed and used for this purpose.

Selected Factors That May Affect Critical Thinking

As researchers have attempted to improve the critical

---

[52] E. J. Furst, "Relationship Between Tests of Intelligence and Tests of Critical Thinking and of Knowledge," Journal of Educational Research, XLIII (April, 1950), pp. 614-625.

[53] K. B. Henderson, "Teaching of Critical Thinking," Phi Delta Kappan, XXXIX (March, 1958), pp. 280-282.

thinking skills of pupils, they have noted the presence of certain factors that may affect critical thinking ability. Pertinent to this study was a consideration of the relation between critical thinking ability and each of the factors of intelligence, reading level, sex, and socio-economic level. Substantial research has been done in each of these areas.

Critical Thinking and Intelligence

It is apparent that there would be a similarity between the ability to think critically and the ability to think as measured by the standard intelligence tests. The following research studies indicate that there is a relationship between the two sets of abilities, but the research conclusions are divided as to how closely they are related.

Though not dealing specifically with critical thinking abilities, Gibson and McGarvey,[54] in their survey of the literature on the nature of the thought process, concluded:

> All (studies) report that there is some relationship between the mental age and achievement. The correlations of achievement with mental age range from .27 to .42.

Concerning himself with some correlates of critical

---

[54]Eleanor Gibson and Hilda McGarvey, "Experimental Studies of Thought and Reasoning," Psychology Bulletins, XXIV (June, 1937), pp. 327-350.

thinking abilities, Hendrickson[55] found a correlation of .63 between I. Q. and his test of critical thinking. Also, Roslow[56] found multiple correlations of .32 to .81 between a battery of rational learning problems and various intelligence tests.

In measuring the relationship between the ability to detect propaganda after instruction, and I. Q., Jewett[57] used a controlled experiment of high school pupils matched as to I. Q., reading ability, grade level, and initial scores on four tests to detect and analyze propaganda. After giving two units of work on propaganda analysis to the experimental group, he found a correlation of .17 between I. Q. and the ability to detect and analyze propaganda. Osborn,[58] in a similar study, reported that I. Q. was essential for critical thinking. The results of his study also showed that an intelligent person might be highly susceptible to propaganda influences.

---

[55] D. Hendrickson, "Some Correlates of Abilities in Critical Thinking in Fifth Grade Children," (unpublished Doctoral dissertation, University of California, Berkeley, 1960), p. 46.

[56] S. A. Roslow, "A Statistical Analysis of Rational Learning Problems," Journal of Genetic Psychology, XLVIII (June, 1936), pp. 441-467.

[57] Jewett, op. cit., p. 115.

[58] W. W. Osborn, "Teaching Resistance to Propaganda," Journal of Experimental Education, VIII (January, 1939), pp. 16, 17.

In generalization studies, Ewert and Lambert[59] reported correlations of .86 to .94 between various criteria of generalizing and intelligence, while Long and Welch,[60] in investigating the influence of levels of abstractness on reasoning ability, found the correlation between mental age and discovering the principle to be .52, but if the chronological age factor was partialled out, the relationship went down to .23.

Other studies reported low correlations between I. Q. and critical thinking abilities. Edwards[61] found low correlations between his critical thinking tests and general intelligence ranging from .00 to .06, and Downing,[62] from the results of his test on scientific thinking, concluded that the I. Q. was something quite different from the abilities that he tested. Researching the ability of tenth, eleventh, and twelfth grade students to recognize fallacies, it was found that this

---

[59] P. H. Ewert, and J. F. Lambert, "The Effect of Verbal Instructions Upon the Formation of a Concept," Journal of Genetic Psychology, VI (June, 1932), p. 413.

[60] L. Long, and L. Welch, "Reasoning Ability in Young Children," Journal of Psychology, XIII (January, 1942), p. 58.

[61] T. Bentley Edwards, "Measurement of Some Aspects of Critical Thinking," Journal of Experimental Education, XVIII (Spring, 1950), p. 271.

[62] E. F. Downing, "Some Results of a Test on Scientific Thinking," Science Education, XX (March, 1936), p. 127.

ability did not depend on mental age, according to Miller.[63] Also, Peterson,[64] in investigating the ability to generalize a principle, found that there was no relationship between intelligence and the ability to generalize if the grade level was held constant.

The above research suggests that although general intelligence as expressed by the I. Q. is something quite different from the ability to reason logically and to think critically, it is related positively to it. However, there is no agreement on the degree of the relationship. Some studies give a very low relationship while still others give a rather high correlation.

Critical Thinking and Reading Ability

Thinking ability and reading ability have long been thought of as being closely related to one another. As early as 1917, Thorndike[65] believed that reading was a thinking and reasoning process. The importance of the thinking and reasoning process in reading was also empha-

---

[63] E. H. Miller, "A Study of Difficulty Levels of Selected Types of Fallacies in Reasoning and Their Relationships to the Factors of Sex, Grade Level, Mental Age and Scholastic Standing," Journal of Educational Research, XLIX (October, 1955), p. 228, 229.

[64] G. M. Peterson, "An Empirical Study of the Ability to Generalize," Journal of Genetic Psychology, VI (March, 1932), p. 113.

[65] E. L. Thorndike, "Reading as Reasoning," Journal of Educational Psychology, VIII (April, 1917), p. 232.

sized by Dewey.[66] Stauffer[67] borrowed a definition of thinking and gave an analogical definition of reading when he said:

> ...like thinking, reading involves a sequence of ideas that moves from a beginning through a pattern of relations to a conclusion.

Emphasizing the critical aspect of thinking, Kottmeyer[68] and Anderson[69] used the term critical reading, and agreed with Kopel[70] that good reading ability encompasses the power to think critically.

Glaser,[71] in his study of critical thinking in the twelfth grade, found a correlation of .77 between the Watson-Glaser test of critical thinking and the scores on the Martin reading comprehension tests before the

---

[66]John Dewey, Construction and Criticism (New York: Columbia University Press, 1930), pp. 13-18.

[67]R. G. Stauffer, "A Directed Reading-Thinking Plan," Education, LXII (May, 1959), p. 532.

[68]W. Kottmeyer, "Classroom Activities in Critical Reading," School Review, LII (November, 1944), p. 242.

[69]H. R. Anderson, F. G. Marcham, and S. B. Dunn, "An Experiment in Teaching Certain Skills of Critical Thinking," Journal of Educational Research, XXXVIII (March, 1944), pp. 241, 242.

[70]D. Kopel, "Semantics and the Teaching of Reading," Educational Methods, XXI (March, 1942), p. 273.

[71]E. M. Glaser, "An Experiment in the Development of Critical Thinking," Teachers College Contributions to Education (New York: Teachers College, Columbia University, 1941), p. 83.

instructional period. He also found that after instruction the relationship increased to .82. Sochor[72] measured the relationship between critical reading and general reading ability of intermediate grade pupils and found a correlation of .64. In a study of the transfer effects of training in logical thinking, Salisbury[73] found that the training produced significant improvement in reading ability.

A study of the relationship between reading and critical thinking in the fifth grade was done by Hendrickson.[74] He found the relationships between critical thinking and reading vocabulary, reading comprehension, and reading total to be .60, .68, and .69 respectively.

Contrary to the above findings, Gans[75] tested the ability of intermediate grade pupils in differentiating between relevant and irrelevant material in the solution of problems. She found a correlation of -.11 between the scores of finding relevant information to the solution of a problem and the scores of general reading. In a

---

[72] E. E. Sochor, "Nature of Critical Reading," Elementary English, XXXVI (January, 1959), pp. 47-50.

[73] R. Salisbury, "A Study of the Transfer Effects of Training in Logical Organization," Journal of Educational Research, XXVIII (April, 1934), p. 254.

[74] Hendrickson, op. cit., p. 34.

[75] Roma Gans, "A Study of the Critical Comprehension in the Intermediate Grades," Teacher College Contribution to Education (New York: Columbia University Press, 1940)

similar vein, Dickinson and Tyler[76] also found a very low positive correlation between the ability to generalize and reading level in the second grade. Alpern[77] confirmed this. In testing the ability of high school students to test hypothesis, he found a low correlation between the ability and reading (.37) when intelligence and age were partialled out. In a similar experiment, Teichman[78] found a correlation of .01 between the ability to improve one's skill in making conclusions and reading ability.

Although there is substantial agreement among those who express their opinions about the high relationship between critical thinking and reading ability, an analysis of the research evidence does not support this. In fact, those who have conducted the research have found a very high correlation (.82) on the one hand, and a negative correlation (-.11) on the other extreme, while additional studies resulted in correlations between the two extremes. This would indicate that the unanimity

---

[76] A. E. Dickenson, and F. T. Tyler, "Experimental Study of the Generalizing Ability of Grade II Pupils," Journal of Educational Psychology, XXXV (October, 1944), p. 440.

[77] M. L. Alpern, "The Ability to Test Hypotheses," Science Education, XXX (October, 1946), p. 228.

[78] Teichman, op. cit., p. 278.

of opinion closely linking reading ability with the ability to think critically is not supported by the research. The research is inconclusive as to the relation-between reading ability and critical thinking ability.

Critical Thinking and Sex

Researchers, and writers also, have posed the question as to whether the obvious factor of sex has any bearing on a student's ability to think critically. Attemps have been made to answer this question.

In a test of fallacies in reasoning, Miller[79] reported that the ability to recognize fallacies did not depend on sex. Likewise, Burt[80] found, as a result of using his reasoning tests with children, that there was no significant difference in reasoning ability between boys and girls. Alpern[81] reports that the factor of sex, in his experiment for testing the ability test hypotheses, was insignificant when the two groups of boys and girls were equivalent in intelligence and in reading ability. These findings were also confirmed in testing critical thinking in general science by Edwards[82] who

---

[79]Miller, op. cit., p. 228.

[80]C. Burt, "Experimental Tests of the Higher Mental Processes and Their Relation to General Intelligence," Journal of Experimental Pedagogy, I (March, 1911), p. 110.

[81]Alpern, op. cit., p. 227.

[82]Edwards, op. cit., p. 113.

reported, "...it may come as a surprise to many, that girls are as good, or as bad, at logical analysis as boys."

Glaser[83] summarized the studies concerning the relation between sex and reasoning which were found largely through analysis of the separate tasks of intelligence tests, saying:

> The results of these analyses indicate that girls and women are superior in linguistic abilities and verbal expression, whereas boys and men are superior in mathematical, mechanical, scientific, and problem solving activities. Some studies indicate that the differences may be culturally conditioned, since these abilities can be altered by training.

In his own study of critical thinking abilities, however, he found that the factor of sex did not distinguish the top 27 per cent in the experimental group from the bottom 27 per cent. As a result of a controlled teaching experiment in the fourth, fifth, and sixth grades, Maw[84] found no significant difference between the boys and the girls on her critical thinking test.

Smith[85] did a controlled experiment regarding cri-

---

[83]Glaser, op. cit., p. 36.

[84]Ethel Maw, "An Experiment in Teaching Critical Thinking in the Intermediate Grades," (unpublished Doctoral dissertation, University of Pennsylvania, 1959), p. 95, 96.

[85]Paul Smith, Jr., "Critical Thinking and the Science Intangibles," Science Education, XLVII (October, 1963), p. 407.

tical thinking and the science intangibles and found evidence contrary to the above findings. He reports that "boys made significantly higher scores than did the girls in their ability to think critically." Also, Peterson[86] found, as a result of an experiment with the ability of elementary and secondary students to generalize, that there was a slight difference favoring the boys. He stated that "these differences cannot be accounted for in terms of age or intelligence differences." Confirming these results with tests of causal relations, McAndrew[87] found that boys received higher scores than girls.

Contrary to the studies indicating a difference favoring the boys, Hendrickson[88] reported a difference at the two per cent level favoring the girls on his test of critical thinking.

A review of the research findings indicates that there is no agreement on the relationship of sex and critical thinking ability. Clearly, the disparity in the research results leaves the question as to the relationship between sex and critical thinking ability unanswered.

---

[86]Peterson, op. cit., p. 113.

[87]M. B. McAndrew, "An Experimental Investigation of Young Children's Ideas of Causality," Studies in Psychology and Psychiatry, VI (February, 1943), p. 63.

[88]Hendrickson, op. cit., p. 36.

Critical Thinking and Socio-economic Level

The relationship between critical thinking ability and the socio-economic level of the pupil has not been widely researched. However, this factor's effect on critical thinking ability has been included in some of the studies.

As part of his investigation, Hendrickson[89] studied the significance of socio-economic status, as measured by occupational groupings, on critical thinking ability. He divided the occupations of the fathers of the pupils in his study into four categories: professional, managerial, clerical, and labor. He tested for significant differences among the critical thinking abilities of the pupils in the four categories. Although he found no significant differences among the abilities of the children in the first three categories, he did find that they all were significantly superior to the labor group category.

Glaser[90] reported findings that were similar:

> A slight tendency was found for those pupils from homes with a higher rating on socio-economic status to do better on the critical thinking tests than the pupils from homes with lower socio-economic status.

McAndrew[91] found a very low correlation between the

---

[89] Ibid., pp. 43, 44.

[90] Glaser, op. cit., p. 150.

[91] McAndrew, op. cit., pp. 64-66.

quantified scores on her test of causal relations and the socio-economic status as measured by occupational groupings, while Burt[92] found that:

> ...children of superior social status tend to be superior in their performance of the higher or more complex tests, while the children of less cultured parents occasionally excell in simpler tests.

These studies point to the fact that children from homes with a higher rating with regard to socio-economic status evidence a superior ability to think critically when compared with the pupils from homes with low socio-economic status. But these findings may well be due to the superior verbal proficiency of the higher socio-economic levels.

Research Dealing with the Improvement of Critical Thinking

The experimental studies related to the improvement of the critical thinking skills revealed great similarity in design and procedure. Control and experimental groups were matched on the basis of one or more variables, usually by means of a pre-test. An instructional period followed in which prepared materials designed to enhance critical thinking ability were used. Finally, one or more post-tests were administered and statistical analysis was then used to determine whether a significant amount of pupil improvement had taken place. The major variation

---

[92]Burt, op. cit., p. 106.

in the research studies was in the specific critical thinking skills that were selected for improvement and the instructional materials that were designed and used for this purpose.

The prototype for research studies relating to the improvement of critical thinking skills is that of Glaser[93] who, in 1940, designed a study in which eight twelfth grade English classes were given eight instructional units that dealt with the same emphases that were to be tested in the five sections of the Watson-Glaser Critical Thinking Appraisal. He reported that:

> The average gain (in composite Z-scores) on the battery of critical thinking tests of the four experimental classes was significantly greater than the average gain of the four control groups...The improvement in ability to think critically appears to be somewhat general in character...The aspect of critical thinking which appears most susceptible to general improvement is the attitude of being disposed to consider in a thoughtful way the problem and subjects that come within the range of one's experience. An attitude of wanting evidence for beliefs is most subject to general transfer.

In 1959, Herber[94] conducted a similar study with students in grades ten, eleven, and twelve in which instruction was given in three of the five areas tested by

---

[93]Glaser, op. cit., pp. 173-175.

[94]Harold Herber, "An Inquiry into the Effect of Instruction in Critical Thinking upon Students in Grades Ten, Eleven, and Twelve," (unpublished Doctoral dissertation, Boston University, 1959)

the "Watson-Glaser" (interpretation, recognition of assumption, and evaluation of argument) and the fourth and fifth sub-tests on inference and deduction were used to determine if there would be a transfer of training in the critical thinking skills in which instruction was given. The results of the study confirmed the fact that the ability to think critically can be improved. However, instruction in the skills of interpretation, recognition of assumption, and evaluation of argument did not bring about a significant improvement in the pupils ability to perform on the sub-tests dealing with inference and deduction.

At the elementary school level, Maw[95] conducted a controlled study of the teaching of critical thinking, and devised a test for her investigation that was to measure three abilities: inference, deduction, and interpretation. She prepared exercises to be used in the teaching of these critical thinking skills with the fourth, fifth, and sixth grades of the experimental group. Comparing the final means of the experimental and control groups, she found a significant difference favoring the experimental group in all grades. From this she concluded that the lessons resulted in the improvement of the

---

[95] Maw, op. cit., pp. 102-110.

critical thinking skills required by her critical thinking test. The fact that Maw found a significant degree of growth on the part of the pupils in the experimental group should not be surprising since she designed both the test and the instructional materials in such a manner that they were closely related to one another. Instruction and practice in the skill should manifest itself on a test that relates directly to this particular skill.

Saadeh,[96] working with fifth and sixth-graders, conducted a study in which teacher's guides were developed that dealt with instruction in logical analysis and with the understandings of the techniques of inquiry for evaluating and guiding thought products in everyday experiences. Like Maw, he developed his own evaluating instrument to be used following the instructional period. After four weeks of instruction, the pupils in the fifteen experimental classes were judged to have made significantly greater gains than the control classes. The scope and depth of this experimental study are noteworthy and Saadeh's research study should be examined closely by anyone working in the area of critical thinking.

A very weak study, due to its paucity of participants and the subjectivity of the evaluations that were made,

---

[96]Saadeh, op. cit., pp. 190-195.

was done by Wassermann.[97] She reports that the experimental group was made up of nine sixth grade pupils who had been selected by their former teachers, peers, and by the investigator as manifesting poor thinking ability. The children were then provided with frequent opportunities to participate in various exercises involving the use of critical thinking skills. After the completion of the experimental period, the children's behavior was again assessed by their teachers, peers, and the investigator, and a thinking test was used. On the basis of this information, she concluded that the tendency to think critically was increased, and a change resulted in the thinking-related patterns of behavior. However, this conclusion was based solely on the several opinions and on the scores on the non-standardized "thinking test." Fortunately, this methodology is atypical for studies in the area of critical thinking.

In the studies that follow, the instructional materials dealt with aspects of critical thinking that were not specifically covered in the evaluating instrument. The test used, in almost every instance, was the Watson-

---

[97] Selma Wassermann, "A Study of the Changes in the Thinking-Related Behaviors in a Selected Group of Sixth Grade Children in the Presence of Selected Techniques and Materials," (unpublished Doctoral dissertation, New York University, 1962).

Glaser Critical Thinking Appraisal[98] whose five sub-tests are: (1) inference, (2) recognition of assumptions, (3) deduction, (4) interpretation, and (5) evaluation of arguments. This test may be characterized as the "classic" in the area of critical thinking evaluation.

An investigation into the effect of understanding and mastery of the rules and principles of logic on critical thinking was conducted by Hyran.[99] In a controlled experiment, he used 200 students matched as to general reading ability, intelligence, language proficiency, and initial reasoning ability. The experimental groups were given instruction that emphasized the principles of logic as the learning content. He found that there was a significant difference in the mean achievement of the two groups in final reasoning ability, and so he concluded:

> (1) correct or logical thinking does depend upon a knowledge of the principles of logic. (2)...upper grade pupils can be taught to think critically and therefore logically through the use of instructional procedures which emphasize the principles of logic as the learning content.

Henderson[100] used a controlled experiment to test whether the use of instructional materials emphasizing

---

[98]Goodwin Watson and Edward Glaser, Watson-Glaser Critical Thinking Appraisal (New York: Harcourt, Brace and World, Inc., 1964).

[99]Hyran, op. cit., p. 130.

[100]Henderson, op. cit., pp. 280-282.

criticism and logic in high school would improve ability in critical thinking and/or improve achievement in school subjects. After instruction, he tested the results by using the Watson-Glaser as well as different tests of achievement in the school subjects that were taught concurrently. He found a significant difference at the five per cent level between the mean gain of the experimental and the control groups, while on the tests of subject achievement there was not a significant difference between the experimental and the control groups.

A third study emphasizing logical reasoning was conducted by Wallen, Haubrich, and Reid.[101] They placed an emphasis on acquainting the students with the principles of logic and experimentation, and with their use. Seven eleventh grade U. S. History classes were matched with control classes, and then given a three week unit on the tools of logical analysis, semantics, and the use of the scientific method. The pupils were encouraged to apply these tools throughout the year. The researchers reported that:

> The results of the evaluation demonstrate quite clearly that mastery of the typical content of the U. S. History course was not impaired by the curriculum modifications. The effectiveness of the program in fostering critical thinking is not unequivocally demonstrated, since the Watson-Glaser

[101] Wallen, Haubrich, and Reid, op. cit., pp. 529-534.

> Critical Thinking Appraisal did not show any difference between the experimental and control groups. The I. D. S. Critical Thinking Test, which on logical grounds may be argued to be a better test, did show rather impressive differences in favor of the students who received the revised curriculum. Further, the reactions of teachers and students, though not intensively studies, strongly support the value of the program.

At the college level, Brembeck[102] investigated the effect of instruction in argumentation on critical thinking. He used matched experimental and control groups in eleven colleges. After a semester course in argumentation, the Watson-Glaser Critical Thinking Appraisal, which was administered initially to the two groups, was again administered to them. He found significant differences in some parts of the test battery favored the experimental groups, while some parts favored the control groups. Graham,[103] in an experimental study at the college level, modified the curricular offerings by providing more student-centered activities for the experimental group. He found that this group made a significant gain above that made by the groups taught with a teacher-centered approach. Similarly, when college physics was

---

[102] W. L. Brembeck, "The Effects of a Course in Argumentation on Critical Thinking Ability," Speech Monographs, XVI (September, 1949), pp. 188, 189.

[103] Daniel Graham, "An Experimental Study of Critical Thinking in Student-Centered Teaching," (unpublished Doctoral dissertation, North Texas State College, 1961).

taught in a way that emphasized discussion rather than lecture, and "discovery" rather than verification in the laboratory, Henkel[104] found that the growth in ability to think critically was significantly greater than that made by the control group which was given the more "traditional" general physics curriculum.

This review of the research related to the improvement of critical thinking skills has revealed that: (1) when attention is directed to the skills and abilities involved in critical thinking, and instructional materials and teaching methodology are designed for the improvement of these skills and abilities, the resulting development in a pupil's critical thinking ability is statistically significant; and (2) though much has been written about critical thinking, both as to what it is and how more instructional emphasis should be placed on it in curricular offerings, surprisingly little actual research has been done.

III. SUMMARY AND CONCLUSIONS

From an investigation of the literature and research related to the topic of this paper, the following conclusions have been reached:

---

[104]Elmer Henkel, "A Study of Changes in Critical Thinking Ability as a Result of Instruction in Physics," (unpublished Doctoral dissertation, University of Toledo, 1965).

1. That the skills and abilities involved in critical thinking are complex and broad in scope, and the writers who seriously consider the term critical thinking define it in a way that reflects their particular emphasis and/or point of view. These writers see critical thinking variously as: (1) problem solving; (2) testing for logical or rational consistency; or (3) examination and evaluation of the products of thought. This investigator conceives of critical thinking as closely related to number three.

2. That research suggests that although general intelligence as expressed by the I. Q. is something quite different from the ability to think critically, it is related positively to it. But the research findings are inconclusive with regard to how closely they are related and the effects of this relationship.

3. That it has been assumed that a pupil's ability to read would be directly reflected in his ability to think critically, but the research evidence does not support this assumption.

4. That the research findings indicate that there is no agreement on the relationship of sex and critical thinking ability.

5. That the research findings indicate that pupils from homes with a higher socio-economic rating score

higher on critical thinking tests when compared with the pupils from homes with low socio-economic status. But the research sheds no light on the causes of this difference.

6. That, though much has been written about critical thinking, surprisingly little research has been done. However, that which has been conducted clearly indicates that the skills and abilities involved in critical thinking can be improved. The research findings also point out that significant improvement takes place only when the instructional materials and the teaching procedures relate to specific critical thinking skills and abilities.

It seems, from the research reviewed, that the study here reported will add to the limited body of knowledge regarding the methods and materials that might be used for the improvement of a pupil's ability to think critically. This study shares a point of view with Saadeh and Henderson who defined critical thinking as examination and evaluation and designed their studies to bring about an improvement in these skills. However, this investigator directed the instruction of the pupils toward a greater depth in a more limited range of these critical thinking skills - those involved in fact and opinion differentiation. This was done in an effort to determine whether instruction in this basic statement assessment operation would result in a significant improvement in

the pupils' critical thinking skills as measured by the Watson--Glaser Critical Thinking Appraisal.

Chapter II of this dissertation has reviewed the literature that is pertinent to the study. Chapter III will present the design of the study.

CHAPTER III

DESIGN OF THE STUDY

In order to determine whether instruction based on the devised instructional instrument (see Appendixes A and B) would bring about a significant growth in a student's critical thinking ability, the research design described in this chapter was developed.

I. SELECTION OF THE CLASSES

The population for this experimental study was made up of 336 students in fourteen ninth grade English classes in three junior high schools of the Santa Rosa School District, Santa Rosa, California. The students were thirteen and fourteen-year old boys and girls.

After receiving administrative approval to conduct the study in the Santa Rosa Schools, the head of the English department in each of the three junior high schools was asked to participate and also to suggest additional teachers who would be willing to be involved in the study.

These eight teachers then administered the Watson-Glaser Critical Thinking Appraisal[1] to their classes.

---

[1]Edward M. Glaser and Goodwin Watson, Watson-Glaser Critical Thinking Appraisal (New York: Harcourt, Brace and World, Inc., 1964).

These fourteen classes were then divided, on the basis of the scores on this test, into seven pairs of classes of comparable means and variances. Seven classes constituted the experimental group and the comparable seven classes became the control group. The number of students in each class ranged from 22 to 29.

II. INSTRUCTION OF THE CLASSES

While the control classes received their regular program of English instruction, the experimental classes were given special instruction by their regular teachers using the teacher's guides and pupil worksheets that were developed by the researcher for this study.

The experimental classes worked with the prepared instructional materials for two fifty-minute periods a week for eight weeks. In addition to the pre-test session, there were fifteen periods devoted to instruction in the differentiation between statements of fact and statements of opinion. Section III of this chapter lists the topics that were covered in these fifteen class periods, and Appendix B contains a complete set of the pupil materials that were used. At the conclusion of the eight weeks of instruction, an added class session was devoted to the final administration of the Critical Thinking Appraisal, bringing the total time devoted to testing and

instruction to some 850 minutes. During the eight weeks in which the experimental group was using the devised instructional materials, the control group received no special instruction but continued with their regular program of English instruction. However, the students in the control group also took the Critical Thinking Appraisal in the same week in which the students of the experimental group took this post-instructional test.

The investigator met with the teachers of the experimental classes prior to the instructional period in order to share the point of view and the purposes underlying the instructional materials and the teacher's guides. There were no other formal meetings although the investigator chatted briefly with the individual teachers on several occasions when delivering or picking up the instructional and/or testing materials. The researcher attempted to use these contacts to maintain interest and contribute to a sense of shared purpose.

There were no training sessions, as such, since the teacher's guides (see Appendix A) were meant to be complete and self-explanatory. However, the occasional, brief contacts between the investigator and the teachers did afford an opportunity to discuss the progress of the instruction and to answer an occasional question.

III. INSTRUCTIONAL MATERIALS

Fifteen lesson units were prepared by the investigator in order to unify and facilitate instruction. These teacher's guides and pupil worksheets related to the differentiation between statements of fact and statements of opinion, and to an understanding of the various kinds of facts and opinions (see definition of terms in Chapter I).

The guides and worksheets dealt with the following subjects: (see Appendixes A and B for the complete set)

1. Fact and Opinion
2. Test: Is It A Fact Or An Opinion?
3. Ways Of Obtaining Factual Information
4. Facts That Are Known Through Your Own Experience
5. Facts That Are Accepted On The Basis Of Some Authority, And Historical Facts
6. Historical Tales That May Or May Not Be True, And Untruths Or Opinions Masquerading As Facts
7. Test: Practice In Differentiating Among The Kinds Of Facts
8. Opinions
9. Expert And Respected Opinions
10. Generally Accepted Opinions
11. Subjective (Personal) And Doubtful Opinions
12. Evaluating Various Opinions
13. Test: Practice In Evaluating Various Opinions

14. Review

15. Final Test On Fact And Opinion Differentiation

In using these lesson units, the teachers of the experimental classes informed their students that a work folder would be kept for each pupil and all the worksheets were then evaluated at the close of the eight-week instructional period. This evaluation became an integral part of the pupil's semester grade in English. This may have resulted in the students being more faithful in completing the assigned worksheet tasks. Also, the Hawthorne Effect probably affected the enthusiasm of the students. Their response to being selected as the participants in an experiment and their reaction to having a new topic injected into the English curriculum probably had some bearing on their class performance during the period of instruction and testing (see limitation 8 in Chapter I).

IV. THE DATA GATHERING INSTRUMENT

The Watson-Glaser Critical Thinking Appraisal was administered to the students of all fourteen participating classes both at the beginning and at the conclusion of the eight week period. The resulting student scores comprise the data on which this study is based.

This test of critical thinking is the most frequently used evaluating instrument in the research that

deals with critical thinking (see the research section in Chapter II). The test, as described in the manual,

> ...consists of a series of test exercises which require the application of some of the important abilities involved in critical thinking. The exercises include problems, statements, arguments, and interpretations of data similar to those which a citizen in a democracy might encounter in his daily life...[2]

The test is comprised of five subtests designed to measure the various skills and abilities involved in critical thinking. There are a total of one hundred items in the test which can be completed in less than fifty minutes at the ninth grade level. The subtests are: inference (twenty items); recognition of assumptions (sixteen items); deduction (twenty-five items); interpretation (twenty-four items); and evaluation of arguments (fifteen items).

The reliability by split-half method for ninth grade pupils is .85 and for the four grades of high school it is .86.

The validity was established through the judgment of thirty-five persons competent in logic and scientific method. It was standardized on 20,312 high school students, including some 6070 ninth-graders.

The correlations of the Critical Thinking Appraisal with various intelligence tests range from .55 to .75,

---

[2] Ibid., p. 2.

and with various reading tests from .63 to .66. The intercorrelation among the five subtests range from .32 to .50 and the correlation between the various subtests and the total test ranges from .62 to .79.

V. STATISTICAL PROCEDURES

The following statistical procedures were applied to the data obtained from the pre-instructional and the post-instructional administrations of the Watson-Glaser Critical Thinking Appraisal:

1. In order to determine the degree of correspondence between the experimental and the control group prior to instruction, the mean and variance of the scores of the pupils in the experimental group was compared with the mean score and variance of the scores of the pupils in the control group. A T-test was used for this purpose based on the formula suggested by Wert and others.[3] This formula is $t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\Sigma x_1^2}{k_1(k_1 - 1)} + \frac{\Sigma x_2^2}{k_2(k_2 - 1)}}}$ where $\bar{X}$ is the mean, Σx^2 is the sum of the squared deviations of the scores in a group away from the mean in that group, and k is the number of cases in the group. This formula was

[3] James E. Wert, Charles O. Neidt, and J. Stanley Ahmann, Statistical Methods in Educational and Psychological Research. New York: Appleton-Century-Crofts, Inc., 1954. p. 130.

also used to compare the mean and variance for the experimental and the control class in each of the seven pairs of classes.

2. The formula for t, given above, was applied to the post-instructional scores of the experimental and and the control groups in order to determine whether there was a statistically significant difference between the mean scores of these groups. The post-instructional scores of each of the experimental classes were compared with the scores made by the matching classes in the control group, using this same T-test.

3. Analysis of variance and the resulting F-test were used to determine whether there was a significant difference among (the among) the mean gains made by the pupils in the various reading, intelligence, and socio-economic levels represented by the pupils in the experimental group. The formulas used were those suggested by McNemar[4] as being applicable to groups of unequal size.

4. To test the significance of the difference between the mean gain made by the boys and the mean gain made by the girls in the experimental group, Chi-square was employed. The procedure used was that suggested by Wert and others[5] in which:

---

[4]Quinn McNemar, Psychological Statistics. New York: John Wiley and Sons, In., 1962. p. 269.

[5]Wert, Neidt, and Ahmann, op cit., p. 147.

$$\chi^2 = \sum \left[\frac{(\text{Actual Frequency} - \text{Expected Frequency})^2}{\text{Expected Frequency}} \right]$$

VI. SUMMARY

Chapter III has presented the design of the present study. It has noted the procedures for the selection of the classes, the instructional methods and materials, the data gathering instrument, and the statistical procedures that were used. Chapter IV will present an analysis of the data collected.

CHAPTER IV

ANALYSIS OF DATA

This study was concerned with the determination of whether instruction in fact and opinion differentiation, using the devised instructional materials (see Appendix A), would bring about a significant improvement in a pupil's ability to think critically. The investigation attempted to: (1) develop an experimental and a control group; (2) instruct the experimental group in fact and opinion differentiation; and (3) then compare the critical thinking abilities of the experimental and the control groups. It further sought to determine how the gains made by the pupils in the experimental group related to their sex and to the various levels of their intelligence, reading ability, and socio-economic status.

The investigator established an experimental and a control group on the basis of the pupil scores on the initial administration of the Watson-Glaser Critical Thinking Appraisal.[1] Table 1 shows the resulting seven pairs of classes with their near comparable means and variances. In order to determine whether these seven pairs of classes were indeed matched pairs, T-tests were

---

[1] Edward M. Glaser and Goodwin Watson, Watson-Glaser Critical Thinking Appraisal, New York: Harcourt, Brace and World, Inc., 1964.

used to test for the significance of the differences in the means and variances. The low t-scores (from .039 to .215) for the seven pairs of classes indicate that the pairs were closely matched in means and variances.

TABLE 1

MEANS AND VARIANCES OF THE SCORES OF THE PUPILS IN THE EXPERIMENTAL AND CONTROL CLASSES ON THE INITIAL TEST

Pair	N	Class	Mean	Diff. in Means	σ	Diff. in σ's	t	Sig. of Diff.
I	24	Experimental-I	65.7	.2	12.48	.02	.054	Not Sig.
		Control-I	65.5		12.46		(2.06)*	
II	23	Experimental-II	54.8	.5	8.26	.42	.195	Not Sig.
		Control-II	54.3		8.68		(2.06)	
III	23	Experimental-III	66.2	.5	8.12	.83	.215	Not Sig.
		Control-III	65.7		7.29		(2.06)	
IV	29	Experimental-IV	59.4	.1	7.20	1.03	.048	Not Sig.
		Control-IV	59.5		8.23		(2.05)	
V	23	Experimental-V	55.4	.2	6.78	.22	.096	Not Sig.
		Control-V	55.2		7.00		(2.06)	
VI	24	Experimental-VI	53.9	.1	8.15	.76	.039	Not Sig.
		Control-VI	54.0		8.91		(2.06)	
VII	22	Exper.-VII	69.7	.3	8.10	.48	.114	Not Sig.
		Control-VII	70.0		8.58		(2.07)	

*Figures in parenthesis represent t-scores for the .05 level of significance for the respective degrees of freedom.

An indication of the close agreement in means and variances of the total experimental group as compared with the total control group is shown in Table 2. A T-test was used to ascertain the degree of matching between the experimental and the control groups. This test yielded a t-value of .086 indicating that the differences between the means and variances was not significant even at the .9 (.126) level.

TABLE 2

MEANS AND VARIANCES OF THE SCORES OF THE PUPILS IN THE EXPERIMENTAL AND CONTROL GROUPS ON THE INITIAL TEST

N	Group	Mean	Diff. in Means	σ	Diff. in σ's	t	Sig. of Diff.
168	Experimental	60.7	.1	10.39	.36	.086 (1.96)*	Not Sig.
	Control	60.6		10.75			

*The t-value for the .05 level of significance for 167 degrees of freedom

Following the eight-week instructional period, the Watson-Glaser Critical Thinking Appraisal was again given to the pupils of both the experimental and the control groups. Table 3 shows a comparison of the mean scores

and variances of the two groups. The application of a T-test resulted in a t-value of 4.88 indicating that the difference between the scores of the two groups, after instruction of the experimental group, is significant at the .05 (1.96) level as well as at the .001 (3.29) level of significance.

TABLE 3

MEANS AND VARIANCES OF THE SCORES OF THE PUPILS IN THE EXPERIMENTAL AND CONTROL GROUPS ON THE FINAL TEST

N	Group	Mean	Diff. in Means	σ	Diff. in σ's	t	Sig. of Diff.
168	Experimental	66.3	6.1	9.39	3.4	4.88 (1.96)* (3.29)**	Sig.
	Control	60.2		12.79			

*The t-value for the .05 level of significance for 167 degrees of freedom
**The t-value for the .001 level of significance for 167 degrees of freedom

The final mean scores of the pupils in the seven pairs of classes were compared through the use of the T-test (see Table 4). The difference between the experimental and the control class for pair IV was significant at the .001 level, for the classes in pair V the level of significance was .01,

and the difference was significant at the .05 level for pairs II and VI. The difference between the experimental and the control classes in each of pairs I, III, and VII was not significant at the .05 level.

TABLE 4

MEANS AND VARIANCES OF THE SCORES OF THE PUPILS IN THE EXPERIMENTAL AND CONTROL CLASSES ON THE FINAL TEST

Pair	N	Class	Mean	Diff. in Means	σ	Diff. in σ's	t	Sig. of Diff.
I	24	Experimental-I	70.4	6.3	10.61	5.13	1.59 (2.06)*	Not Sig.
		Control-I	64.1		15.74			
II	23	Experimental-II	58.2	5.6	7.57	.01	2.44 (2.07)	Sig.
		Control-II	52.6		7.56			
III	23	Experimental-III	69.4	1.6	7.63	.05	.69 (2.07)	Not Sig.
		Control-III	67.8		7.68			
IV	29	Experimental-IV	66.6	8.8	6.55	3.77	3.79 (2.05)	Sig.
		Control-IV	57.8		10.32			
V	23	Experimental-V	62.8	8.6	6.71	2.50	3.53 (2.07)	Sig.
		Control-V	54.2		9.21			
VI	24	Experimental-VI	60.3	5.9	6.26	3.76	2.43 (2.07)	Sig.
		Control-VI	54.4		10.02			
VII	22	Experimental-VII	76.5	5.4	5.72	9.44	1.24 (2.07)	Not Sig.
		Control-VII	71.1		15.16			

*Figures in parenthesis represent t-values for the .05 level of significance for the respective degrees of freedom.

The Watson-Glaser Critical Thinking Appraisal Manual[2] indicates that the correlation between ninth-graders' scores on this critical thinking test and their intelligence quotients has been determined to be .75. However, it was a purpose of this study to ascertain whether the gains made by the pupils of the experimental group, after instruction, varied with their level of intelligence. The measure of I.Q. for this study was the California Test of Mental Maturity.[3]

Because analysis of variance is more applicable to groups of near comparable size, the various I.Q. scores were grouped into four levels. Table 5 shows these four groupings and the gains made by the pupils in each level.

TABLE 5

GAINS MADE BY THE PUPILS IN THE EXPERIMENTAL GROUP RELATED TO THEIR I.Q. LEVELS

Group	Range	Students	Group Gain	Ave. Gain
I	80-100	36	192	5.33
II	101-110	42	223	5.31
III	111-120	45	324	7.20
IV	121-140	31	146	4.71
	Total	154	885	5.75

[2] Ibid., p. 13.

[3] W. Clark, E. Sullivan, and E. Tiegs, California Test of Mental Maturity, Sacramento: California Test Bureau, 1959.

Analysis of variance (see Table 6) and the resulting F value of 1.07 reveals that there was not a significant difference at the .05 level in the amount of gain made by the pupils in the various levels of intelligence.

TABLE 6

VARIANCE TABLE FOR GAIN RELATED TO I.Q. LEVELS

Source	Sum Of Squares	df	Variance Estimate
Between Groups	142.46	3	44.15 = s_b^2
Within Groups	6150.24	150	41.00 = s_w^2
Total	6292.70	153	

$$F = \frac{44.15}{41.00} = 1.07 \quad (.05 \text{ level} = 2.60)$$

To determine the relation of the gains made by the pupils in the experimental group to the level of their reading ability, four groups of near comparable size were used. These groups, as shown in Table 7, corresponded roughly to grade level (Group II), below grade level (Group I), one year above grade level (Group III), and to more than one year above grade level (Group IV). The pupils' level of reading ability was derived from their scores on the reading section of the California Achievement Test.[4]

[4] W. W. Clark and E. W. Tiegs, California Achievement Test. Form Y; Sacramento: California Test Bureau, 1959.

TABLE 7

GAINS MADE BY THE PUPILS IN THE EXPERIMENTAL GROUP RELATED TO THEIR READING LEVELS

Group	Range	Students	Group Gain	Ave. Gain
I	5.4-8.7	39	246	6.31
II	8.8-9.8	41	234	5.71
III	9.9-10.9	40	290	7.25
IV	11.0-12.9	32	130	4.06
	Total	152	900	5.92

Analysis of variance (see Table 8) and the resulting F value of 1.51 reveals that there was not a significant difference at the .05 level in the amount of gain made by the pupils in the various levels of reading ability.

TABLE 8

VARIANCE TABLE FOR GAIN RELATED TO READING LEVELS

Source	Sum Of Squares	df	Variance Estimate
Between Groups	188.71	3	$62.9 = s_b^2$
Within Groups	5948.00	148	$40.2 = s_w^2$
Total	6136.71	151	

$$F = \frac{62.9}{40.2} = 1.51 \qquad (.05 \text{ level} = 2.67)$$

A comparison was made of the gains made by the boys of the experimental group with those gains made by the girls in order to determine whether there was a significant difference between the gains made by the two groups. Chi-square was used (see Table 9) and a value of 2.02 resulted. This value, when compared with the value of 3.84 for the .05 level of significance, indicates that there was not a significant difference between the gains made by the boys and those made by the girls.

TABLE 9

CHI-SQUARE TABLE COMPARING THE GAINS MADE BY THE BOYS IN THE EXPERIMENTAL GROUP WITH THOSE MADE BY THE GIRLS

Number Of Students	Sex	Actual Gain	Expected Gain
81	Boys	435	456.68
84	Girls	497	475.32
165	Total	932	932

$\chi^2 = 2.02$ (.05 level = 3.84)

Finally, it was a purpose of this study to determine whether the gains made by the pupils in the experimental group varied with their socio-economic status. A correlation of .91 between the father's occupation and the

family's socio-economic status was found by Warner.[5] The occupational rating scale that Warner[6] devised was used to ascertain the socio-economic level for the 152 pupils whose fathers' occupations were known. Table 10 shows the number of students in each rating level and their average gain after instruction.

TABLE 10

GAINS MADE BY THE PUPILS IN THE EXPERIMENTAL GROUP RELATED TO THEIR SOCIO-ECONOMIC LEVELS

Rating Assigned To Occupation	Number Of Students	Group Gain	Average Gain
I	9	59	6.55
II	48	223	4.65
III	47	240	5.11
IV	26	162	6.22
V	13	123	9.46
VI	9	72	8.00
VII	0	0	0
Total	152	879	5.79

Analysis of variance (see Table 11) and the resulting F value of 1.71 indicate that there was not a significant

[5] W. Lloyd Warner, M. Meeker, and K. Ellis, Social Class in America. Chicago: Science Research Associates, 1949, p. 139.

[6] Ibid., pp. 140-141

difference at the .05 level in the amount of gain made by the pupils in the various socio-economic levels.

TABLE 11

VARIANCE TABLE FOR GAIN RELATED TO SOCIO-ECONOMIC LEVELS

Source	Sum of Squares	df	Variance Estimate
Between Groups	312.88	5	62.57 = s_b
Within Groups	5333.28	146	36.53 = s_w
Total	5646.16	151	

$$F = \frac{62.57}{36.53} = 1.71 \qquad (.05 \text{ level} = 2.21)$$

SUMMARY

This chapter has reported on the matching of the experimental and the control groups and on the statistical analysis of the data collected from the final administration of the Watson-Glaser Critical Thinking Appraisal. In analyzing the data, the scores made by the pupils in the experimental groups were compared with those made by the pupils in the control group. The mean scores of the experimental and the control classes for each of the seven matched pairs of classes were also compared. It was further determined how the gains made by the pupils in the experimental group related to their level of intel-

ligence and reading ability, to their sex, and to their level of socio-economic status.

Chapter V of this paper will present conclusions drawn from this study. It will also offer recommendations for additional research in this area.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

This experimental study was devoted to a determination of whether instruction in the critical thinking skills involved in the limited area of fact and opinion differentiation would bring about a significant improvement in a pupil's broad range of critical thinking abilities. The experimental procedure was organized around the study design presented in Chapter III. The findings herein reported are based upon the guided application of the instructional materials (see Appendixes A and B) developed for this study to an experimental group consisting of 168 ninth-graders. Resulting statistical evidence is reported in Chapter IV of this paper.

It should be noted that this study is solely concerned with the results that the devised instructional instrument provided, and not with an analysis of that instrument. The conclusions and recommendations are based upon that data gleaned from the use of the Watson-Glaser critical thinking test. This test was administered after eight weeks of instruction based upon the use of the devised guides and instructional materials.

The following conclusions and recommendations are drawn from this study. They are expressed in terms of their relationship to the limitations and assumptions outlined in Chapter I of this paper.

I. CONCLUSIONS BASED UPON DATA FROM THE INSTRUMENT

1. Based on the findings reported in Chapter IV, it may be concluded that planned instruction in a specific critical thinking ability, fact and opinion differentiation, does make a statistically significant difference in a ninth-grader's ability to think critically, in a general sense, as measured by the Watson-Glaser Critical Thinking Appraisal, when compared with the effect of incidental instruction in these skills. The gain in the mean scores of the pupils in the experimental group was 5.6 while the change in the mean scores of the pupils in the control group was -.4. Statistical analysis indicates that the hypothesis that this difference was due solely to chance can be rejected at the .001 level of confidence.

2. This study's findings concerning the relationship between a pupil's intelligence and the amount of gain that he made showed that a pupil's intelligence level did not contribute statistically significantly to the amount of gain that he made (see Table 6). This

would indicate that the instructional materials and the procedures suggested in the teacher's guides were, in this case, of similar benefit to the various levels of intelligence represented by the pupils in the experimental group.

3. The results of this study indicated that the sex of a pupil did not have a significant effect upon the gain made by the pupil (see Table 9).

4. From the data gleaned from this study (see Table 8), it would seem appropriate to conclude that the reading levels that were represented in this study had little or no effect upon a student's ability to learn to think critically.

5. The results of this study showed no statistically significant differences among the gains made by the pupils in the various socio-economic levels that were represented. However, because of the approximate solution used in the analysis as a result of the grossly unequal numbers in the socio-economic levels, the findings should be taken with reservation.

6. The results of this study indicated that instruction based upon the devised teacher's guides and pupils' materials concerning fact and opinion differentiation does bring about a significant improvement in a pupil's ability to think critically in a general sense. While the data

allows the researcher to conclude that the devised instructional materials were effective in bringing about a statistically significant gain at the conclusion of the period of instruction, no claims can be made for the lasting effects of this pupil gain in critical thinking ability.

II. GENERAL CONCLUSIONS

On the basis of the findings of this experimental study, the researcher has drawn the following general conclusions:

1. That teachers who are desirous of teaching for pupil improvement in critical thinking skills and abilities probably need prepared instructional materials and teacher's guides designed for this purpose. Even though the desire to bring about an increase in their pupils' ability to think critically may be present, certain factors may prevent or inhibit the development of the desired instructional materials. For most teachers, the use of prepared materials makes possible an improvement in the content, continuity, and orderly progression in the instruction.

2. That the teachers in this experiment were able to use the instructional materials devised for this study without any special training in the skills and abilities involved in critical thinking or in the teaching of such

skills. The investigator met with the teachers of the experimental classes in order to share the point of view and purpose of the study. No instruction, however, was given in the specific critical thinking skills and abilities that were included in the instructional format. It can be concluded that instruction in the skills of critical thinking and/or instruction in the teaching of critical thinking skills is not necessarily needed in order for teachers to use the devised instructional materials successfully.

3. That pupils whose intelligence level was in the 111-120 range benefitted to a greater degree from the instruction given than did those pupils at the other intelligence levels (see Table 5). Although the gains made by the pupils in the various intelligence levels did not vary significantly statistically, it appears noteworthy that those pupils whose I.Q. ranged from 111 through 120 averaged nearly two points more gain than did the pupils in any of the other I.Q. levels. Though the data of this study reveals the difference in gain, no indication is given as to how or why this difference came about.

4. That this study's findings indicate that instruction in one aspect of critical thinking makes a statistically significant contribution to a pupil's growth in the broad spectrum of critical thinking abilities. The Watson-

Glaser Critical Thinking Appraisal tests for the critical thinking abilities involved in: (1) inference; (2) recognition of assumptions; (3) deduction; (4) interpretation; and (5) evaluation of arguments. The instructional materials used in this study were not specifically related to any of these five areas, and yet, after instruction in fact and opinion differentiation, the pupils made a statistically significant gain in their scores on this general critical thinking test.

5. That when the gains made by the pupils in the experimental group were related to their socio-economic levels (Table 10), those pupils in levels V and VI were found to have made average gains that were well above the average gain for all socio-economic levels (9.46 and 8.00 as compared with 5.79). The thirteen students in level V and the nine in level VI were from families with lower socio-economic status evidencing an upward mobility in a predominately middle-class residential area. The strong desire to improve that resulted in a superior performance by these pupils may well have reflected the rising aspirations of their families. Though the data from this study justifies the conclusion that these pupils did considerably better than their peers, the suggested reason for this is neither supported nor denied by the data of this study.

III. RECOMMENDATIONS FOR FURTHER STUDY

Inasmuch as experimentation in critical thinking instruction is a comparatively unresearched field, judging from the limited number of research studies found, the writer hopes that the findings of this study may serve to generate additional experimental and exploratory studies in this area. In addition, it is hoped that the results of this study will encourage depth research in the important area of fact and opinion differentiation.

The writer believes that this study has indicated the need for further investigation into the area of critical thinking in general and of fact and opinion differentiation in particular. The following are suggested as being among the most promising:

1. Duplicate this study in the first eight weeks of the fall term. Encourage the pupils to apply what is learned throughout the year, and then measure their gain in critical thinking ability at the end of the school year and again a year later.

2. Studies be done to determine the amount and kind of references to fact and opinion differentiation that appear in the elementary, junior, and senior high school textbooks.

3. A study be done in order to validate and perhaps

modify the devised teacher's guides and instructional materials used in this study.

4. Adapt the instructional materials and teaching procedures used in this study to the abilities of pupils in the lower grade levels and replicate the study.

5. Compare what an experimental group of high school students value and believe with what they value and believe after an extended period of instruction in critical thinking.

6. Investigate the effectiveness of the materials and procedures used in this study with remedial classes.

7. In order to determine whether intensive instruction and practice in critical thinking will increase "intelligence", compare pupil scores on a standard intelligence test before and after extensive and intensive work with the materials used in this study.

8. Compare the effectiveness of the teachers' use of the instructional materials, as measured by pupil gain, on the basis of whether the teachers had a previous seminar or workshop devoted to the development of their own critical thinking abilities and the skills of teaching critical thinking, or just an introductory meeting with the experimentor before embarking on the teaching of the unit in the classroom. Include in this, pupil and teacher questionnaires for additional evaluative information.

IV. CURRICULAR IMPLICATIONS

On the basis of the findings of this study and the widely espoused importance of education for effective thinking (see Introduction, Chapter I), this writer suggests the following curricular innovations:

1. Develop and validate a course of study in the various aspects of critical thinking for grades K - 12 that well might be incorporated into the curriculum of any one of several disciplines.

2. Develop and incorporate into the curriculum a unit on the place and value of opinions and traditions in one's life. Show how these are the "stuff" out of which cultures are developed by utilizing an elementary introduction to cultural anthropology.

3. In order to enhance pupil preparation for a future characterized by change, develop and incorporate a course in "How to Think". This course might well be developed around the three major aspects of critical thinking: problem solving, rational or logical consistency, and statement evaluation.

4. Include in the high school curriculum a unit that would deal with considerations of what influences people's opinions and colors their interpretation of facts, how one arrives at a knowledge of the "true facts" or the "truth", and how opinions are developed.

5. Provide an opportunity for the high school student to develop and/or clarify his own value structure or value system based on a guided application of the critical thinking skills.

It is strongly hoped that the present study may serve as an incentive and a point of departure for numerous studies designed to investigate, explore, and evaluate fact and opinion differentiation and its effect upon students' ability to think critically. It is also hoped that this will have real and lasting effect upon what is happening in the schools.

Unanswered questions exposed by this experimental study of critical thinking should serve as a springboard from which additional studies can be launched. Critical thinking, in general, and fact and opinion differentiation, in particular, are rich sources for further scholarly investigation.

BIBLIOGRAPHY

BIBLIOGRAPHY

A. BOOKS

Bartlett, Frederick. Thinking: An Experimental And Social Study. New York: Basic Books, 1958.

Black, Max. Critical Thinking. New York: Prentice-Hall, 1965.

Bloom, Benjamin (ed.). Taxonomy of Educational Objectives: Handbook I: Cognitive Domain. New York: Longman, Green and Co., 1956.

Bruner, Jerome S., J. J. Goodnow, and G. Austin. A Study of Thinking. New York: Wiley and Sons, 1956.

Burton, William H., R. B. Kimball, and R. L. Wing. Education for Effective Thinking. New York: Appleton-Century Crofts, 1960.

Dewey, John. Construction and Criticism. New York: Columbia University Press, 1930.

_____. How We Think. Boston: D. C. Heath and Co., 1933.

Flavell, John. The Developmental Psychology of Jean Piaget. Princeton, N. J.: Van Nostrand Press, 1962.

Horn, Ernest. Methods of Instruction in the Social Studies. New York: Charles Scribner's and Sons, 1937.

Hullfish, H. Gordon, and P. G. Smith. Reflective Thinking: The Method Of Education. New York: Dodd, Mead and Co., 1963.

Johnson, Donald. The Psychology of Thought and Judgment. New York: Harper and Bros., 1955.

Piaget, Jean. Judgment and Reasoning in the Child. New York: Harcourt, Brace and Co., 1928.

_____. The Language and Thought of the Child. New York: The Humanistic Press, Inc., 1959.

Russell, David. Children's Thinking. Boston: Ginn and Company, 1956.

Schwab, Joseph, and Paul Brandwein. The Teaching of Science. Cambridge, Massachusetts: Harvard University Press, 1962.

Smith, Henry, and Emerald Dechant. Psychology in Teaching Reading. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961.

Symonds, Paul. Education and the Psychology of Thinking. New York: McGraw-Hill, Inc., 1936.

Taba, Hilda. Thinking in Elementary School Children. San Francisco: San Francisco State College, 1964.

Warner, W. Lloyd, M. Meeker, and K. Ellis. Social Class in America. Chicago: Science Research Associates, 1949.

Wellington, C. Burleigh. Teaching for Critical Thinking. New York: McGraw-Hill, Inc., 1960.

B. PERIODICALS

Alpern, M. L. "The Ability to Test Hypothesis," Science Education, XXX (October, 1946), 220-229.

Anderson, H. R., F. G. Marcham, and S. B. Dunn. "An Experiment in Teaching Certain Skills of Critical Thinking," Journal of Educational Research, XXXVIII (March, 1944), 241-251.

Arnold, D. L. "Testing Ability to Use Data in the Fifth and Sixth Grades," Education Research Bulletin, XXIV (February, 1938), 75-79.

Berlyne, D. E. "Recent Developments in Piaget's Work," British Journal of Educational Research, XXVII (February, 1957), 1-12.

Blair, G. M., and M. R. Goodson. "Development of Scientific Thinking Through General Science," School Review, XLVII (November, 1939), 697-701.

Braine, M. D. S. "The Ontogeny of Certain Logical Operations: Piaget's Formulation Examined by Nonverbal

Methods," Psychological Monographs, LXXIII, No. 5, 1959.

Brembeck, W. L. "The Effects of a Course in Argumentation on Critical Thinking Ability," Speech Monographs, XVI (September, 1949), 177-189.

Burt, C. "Experimental Tests of the Higher Mental Processes and Their Relation to General Intelligence," Journal of Experimental Pedagogy, I (March, 1911), 106-110.

Cruetz, Gloria, and Kalil Gezi. "Developing Critical Thinking in the Current Events Class," Journal of Educational Research, LVIII (April, 1965), 366-368.

DeBoer, J. J. "Teaching Critical Reading," Elementary English Review, XXIII (October, 1946), 251-254.

Devine, T. G. "Critical Thinking in the English Class," Peabody Journal of Education, XXXIX (May, 1962), 359-365.

Dickenson, A. E., and F. T. Tyler. "Experimental Study of the Generalizing Ability of Grade II Pupils," Journal of Educational Psychology, XXXV (October, 1944), 435-440.

Downing, E. F. "Some Results of a Test on Scientific Thinking," Science Education, XX (March, 1936), 121-128.

_____. "The Elements and Safeguards of Scientific Thinking," The Scientific Monthly, XII (May, 1928), 241-243.

Dressel, Paul. "Critical Thinking: The Goal of Education," National Education Association Journal, XLIV (October, 1955), 418-420.

Edwards, T. Bentley. "Measurement of Some Aspects of Critical Thinking," Journal of Experimental Education, XVIII (Spring, 1950), 263-272.

Elkind, E. "The Development of Quantitative Thinking: A Systematic Replication of Piaget's Studies," Journal of Genetic Psychology, XCVIII (June, 1961), 219-227.

Ennis, Robert. "A Concept of Critical Thinking," Harvard Educational Review, XXXII (Winter, 1962), 82-84.

_____. "Needed: Research in Critical Thinking," Educational Leadership, XXI (October, 1963), 17-20.

Estes, B. W. "Some Mathematical and Logical Concepts in Children," Journal of Genetic Psychology, LXXXVIII (March, 1956), 219-222.

Ewert, P. H., and J. F. Lambert. "The Effect of Verbal Instructions Upon the Formation of a Concept," Journal of Genetic Psychology, VI (June, 1932), 400-413.

Fawcett, H. P. "Curricula Value of the Future," Progressive Education, XXXIII (January, 1956), 1-44.

Ferrell, F. H. "They Learn to Think for Themselves," Progressive Education, XXVI (October, 1948), 12-14.

Fisher, R. T. "What Knowledge is of the Greatest Worth?" Education, LXXXIII (January, 1963), 304-305.

Freedman, I. "Developing Critical Mindedness," Clearing House, XXXI (February, 1956), 103-105.

Furst, E. J. "Relationship Between Tests of Intelligence and Tests of Critical Thinking and of Knowledge," Journal of Educational Research, XLIII (April, 1950), 614-625.

Gibson, Eleanor, and Hilda McGarvey. "Experimental Studies of Thought and Reasoning," Psychology Bulletins, XXXIV (June, 1937), 327-350.

Glicksburg, C. I. "Practical Logic in the Classroom," English Journal, XXXV (January, 1946), 14-21.

Grener, Norma, and L. E. Raths. "Thinking in Grade Three," Education Research Bulletin, XXIV (January, 1945), 38-42.

Guilford, J. P. "The Structure of Intellect," Psychological Bulletins, LIII (July, 1956), 280-284.

Haubich, Vernon. "Some Problems in Critical Thinking," Progressive Education, XXXIV (March, 1957), 59-63.

Henderson, K. B. "Teaching of Critical Thinking," Phi Delta Kappan, XXXIX (March, 1958), 279-283.

Hyran, G. M. "An Experiment in Developing Critical Thinking in Children," Journal of Experimental Education, XXVI (Winter, 1957), 126-131.

Jelinck, J. "Literature and the Development of Critical Thinking," Clearing House, XXX (May, 1956) 642-644.

Jewett, A. "Detecting and Analyzing Propoganda," English Journal, XXIX (February, 1940), 105-115.

Karplus, R. "Meet Mr. O.," Science and Children, I (November, 1963), 19-24.

Kemp, C. G. "Improvement of Critical Thinking in Relation to Open-Closed Belief Systems," Journal of Experimental Education, XXXI (March, 1963) 321-323.

Kopel, D. "Semantics and the Teaching of Reading," Educational Methods, XXI (March, 1942) 270-277.

Kottmeyer, W. "Classroom Activities in Critical Thinking," School Review, LII (November, 1944), 557-564.

Long, L., and L. Welch. "Reasoning Ability in Young Children," Journal of Psychology, XIII (January, 1942) 41-59.

Mason, S. "Essentials of Thinking," Baltimore Education, XVII (January, 1939), 19-22.

McAndrew, M. B. "An Experimental Investigation of Young Children's Ideas of Causality," Studies in Psychology and Psychiatry, VI (February, 1943), 43-66.

Melzer, J. H. "What is Functional Logic?" Peabody Journal of Education, XXX (January, 1952), 80-89.

Metcalf, Lawrence. "The Reflective Teacher," Phi Delta Kappan, XLIV (October, 1962), 17-21.

Miller, E. H. "A Study of Difficulty Levels of Selected Types of Fallacies in Reasoning and Their Relationships to the Factors of Sex, Grade Level, Mental Age, and Scholastic Standing," Journal of Educational Research, XLIX (October, 1955), 123-130.

Osborn, W. W. "Teaching Resistance to Propoganda," Journal of Experimental Education, VIII (January, 1939), 1-17.

Osler, S. F., and M. W. Fivel. "Concept Attainment: I. The Role of Age and Intelligence in Concept Attainment by Induction," Journal of Experimental Psychology, LXII (January, 1961), 1-8.

Peterson, G. M. "An Empirical Study of the Ability to Generalize," Journal of Genetic Psychology, VI (March, 1932), 90-114.

Roslow, S. A. "A Statistical Analysis of Rational Learning Problems," Journal of Genetic Psychology, XLVIII (June, 1936), 441-467.

Salisbury, R. "A Study of the Transfer Effects of Training in Logical Organization," Journal of Educational Research, XXVIII (April, 1934), 241-254.

Siller, J. "Socio-economic Status and Conceptual Thinking," Journal of Abnormal and Social Psychology, LV (October, 1957), 365-371.

Spielberger, C. D. "The Effect of Manifest Anxiety on the Academic Achievements of College Students," Mental Hygiene, XLVI (July, 1962), 420-426.

Smith, B. O. "The Improvement of Critical Thinking," Progressive Education, XXX (March, 1953), 129-134.

Smith, Paul M. "Critical Thinking and the Science Intangibles," Science Education, XLVII (October, 1963), 405-408.

Sochor, E. E. "Nature of Critical Reading," Elementary English, XXXVI (January, 1959), 47-50.

Stauffer, R. G. "A Directed Reading-Thinking Plan," Education, LXXIX (May, 1959), 532-535.

Taba, Hilda. "What is Proof?" Educational Leadership, I (April, 1944), 393-396.

Teichman, L. "The Ability of Science Students to Make Conclusions," Science Education, XXVIII (May, 1944), 268-279.

Thorndike, E. L. "Reading as Reasoning," Journal of Educational Psychology, VIII (April, 1917), 232-233.

Ulmer, G. "Teaching Geometry to Cultivate Reflective Thinking," Journal of Experimental Education, VIII (Fall, 1939), 18-25.

Wallen, Norman E., Vernon F. Haubich, and Ian E. Reid. "The Outcomes of Curriculum Modifications Designed to Foster Critical Thinking," Journal of Educational Research, LVI (July-August, 1963), 529-535.

C. PUBLICATIONS OF THE GOVERNMENT, LEARNED SOCIETIES AND OTHER ORGANIZATIONS

American Council on Education, Committee on a Design for General Education. A Design for General Education. American Council on Education Studies, Series I, Number XVIII, Volume VIII. Washington, D. C.: American Council on Education, 1944.

Educational Policies Commission. The Purpose of Education in American Democracy. Washington, D. C.: National Education Association, 1938.

Educational Policies Commission. The Central Purpose of American Education. Washington, D. C.: National Education Association, 1961.

Fawcett, Harold. "The Nature of Proof," Thirteenth Yearbook National Council Teachers of Mathematics. New York: Teachers College, Columbia University, 1938.

Gans, Roma. "A Study of the Critical Comprehension in the Intermediate Grades," Teacher College Contributions to Education. New York: Teachers College, Columbia University, 1940.

Glaser, E. M. "An Experiment in the Development of Critical Thinking," Teachers College Contribution to Education. New York: Teachers College, Columbia University, 1941.

Harvard Faculty Committee. General Education in a Free Society. Cambridge, Massachusetts: Harvard University Press, 1946.

President's Commission of Higher Education. "Higher Education for American Democracy: Establishing the Goals," Washington, D. C.: U. S. Goverment Printing Office, 1947.

D. ESSAYS AND ARTICLES IN COLLECTION

McKeachie, W. J. "Motivation, Teaching Methods, and College Learning," Nebraska Symposium on Motivation. Lincoln Nebraska: University of Nebraska Press, 1961.

Suchman, J. Richard. "The Child and the Inquiry Process," Intellectual Development: Another Look. Edited by A. Passow. Washington, D. C.: Association for Supervision and Curriculum Development, 1964.

E. ENCYCLOPEDIA AND DICTIONARY REFERENCES

Good, Carter (ed.). Dictionary of Education. New York: McGraw-Hill Book Company, Inc., 1959.

Reitz, W. "Higher Mental Processes," Encyclopedia of Educational Research. New York: MacMillan Company, 1950.

Webster's Third New International Dictionary. Springfield, Massachusetts: G. and C. Merriam Company, 1966.

F. TESTS

Clark, W. W., and E. W. Tiegs. California Achievement Test. Form Y. Sacramento, California: California Test Bureau, 1959.

Clark, W. W., E. T. Sullivan, and E. W. Tiegs. California Test of Mental Maturity. Sacrament, California: California Test Bureau, 1959.

Watson, Goodwin, and Edward M. Glaser. Watson-Glaser Critical Thinking Appraisal. New York: Harcourt, Brace and World, Inc., 1964.

G. UNPUBLISHED MATERIALS

Graham, Daniel. "An Experimental Study of Critical Thinking in Student-Centered Teaching," Unpublished Doctoral dissertation, North Texas State College, Denton, 1961.

Hendrickson, D. "Some Correlates of Abilities in Critical Thinking in Fifth Grade Children," Unpublished Doctoral dissertation, University of California, Berkeley, 1960.

Henkel, Elmer. "A Study of Changes in Critical Thinking Ability as a Result of Instruction in Physics," Unpublished Doctoral dissertation, University of Toledo, Toledo, 1965.

Herber, Harold. "An Inquiry into the Effect of Instruction in Critical Thinking Upon Students in Grades Ten, Eleven, and Twelve," Unpublished Doctoral dissertation, Boston University, Boston, 1959.

Maw, Ethel. "An Experiment in Teaching Critical Thinking in the Intermediate Grades," Unpublished Doctoral dissertation, University of Pennsylvania, 1959.

Saadeh, I. Q. "An Evaluation of the Effectiveness of Teaching for Critical Thinking in the Sixth Grade," Unpublished Doctoral dissertation, University of California, Berkeley, 1962.

Wassermann, Selma. "A Study of the Changes in Thinking-Related Behaviors in a Selected Group of Sixth Grade Children in the Presence of Selected Techniques and Materials," Unpublished Doctoral dissertation, New York University, New York, 1962.

APPENDIX

APPENDIX A

TEACHER'S GUIDE FOR FACT AND OPINION UNIT

INTRODUCTION

In early publications on the purpose of education in a free society, the Educational Policies Commission (1938), the Harvard Faculty Committee (1946), and the American Council on Education (1944) indicated that democracy requires that the development of the ability to think be a major goal of education.

To participate effectively and intelligently in the functionings of a democracy, an individual must be able to make sound judgments, wise choices, and correct appraisals. The individual, in addition to being affected with cultural customs and traditional habits, is constantly being bonbarded with verbal and written communication that attempts to influence his judgments, choices, and appraisals. To cope with these influences, the individual must be able to carefully consider the evidence and base his choices and actions on understandings which he himself achieves and on values which he examines for himself.

To achieve the above object, an individual must be capable of critical thinking. This was emphasized by the President's Commission on Higher Education in 1947 which stated that the "development of the reasoning faculty, of the habit of critical appraisal, should be the constant and pervasive aim of all education, in every field and at every level."

The content of this unit will be addressing itself to the emphasis on understandings that can develop a pupil's ability to: (1) evaluate statements as to whether they are facts or opinions, and (2) to further differentiate these statements into the kinds of facts and the kinds of opinions represented. The pupils are to learn to identify statements and then to evaluate them in terms of their credibility.

If a pupil can learn to correctly evaluate statements, he will have acquired a skill that will make possible the development of a personal value-system on more rational grounds, and judgments, appraisals, and choices can be made on more rational grounds as well.

UNIT I - FACT AND OPINION

I. It might be a good idea to begin with a discussion of the mechanics of the total Unit. How many weeks, how many times a week, for how long each period, etc.

II. Discuss the grading system you intend to use for the Unit. This will insure a certain amount of motivation even where it isn't arising from some other source.

Some suggestions as to grading are:

a. Encourage them to keep a "Fact and Opinion Unit" folder in which to faithfully put their completed worksheets. This will be graded as a notebook at the end of the eight weeks.
b. Expect all lessons to be included and complete.
c. Grades might be based on:
    1. Evidence of interest
    2. Degree of completeness
    3. Degree of originality in answers (where possible)
    4. Legibility and neatness
d. Grade on participation in the discussions in class also.

III. Read the "Introduction" to them, or share the ideas expressed in it with them, and elaborate to indicate possible importance and relevance of unit to them.

IV. Write some statements on the board prior to class and discuss them with the pupils as to whether they are Fact or Opinion.

V. Develop Section I of Unit I together. Have pupils write down the statements developed by class and teacher.

Suggestions for instances might be:

1. A statement indicating how much of a particluar medicine should be taken and how often.
2. When someone tells you that a close relative is mentally retarded.

UNIT I - CONT.

3. In accepting testimony in a court trial.
4. When someone tells you that you are a bore.
5. The statement as to the supportive strength of a rope to be used in mountain climbing.
6. When a service station attendant assures you that there is sufficient water in the radiator and/or battery.

VI. Sections II and III. Carefully analyze parts (1), (2), and (3) of the definition of a fact. Lead the pupils in familiarizing themselves with this definition and the definition of an opinion, using whatever techniques you've found helpful in this regard in the past. Then they do the work indicated under II and III.

UNIT II - TEST

I. Collect Unit I and file in particular folder. (One for each pupil.)

II. For those who finish the Test before all are through, suggest work to do (e.g. free reading, etc.) while the others finish test.

III. Go over directions for test with the pupils.

IV. When all have finished, except two or three, exchange tests (if desired), correct, and discuss freely.

Suggested Key:

1. O	11. O	21. F	31. F	41. O
2. F	12. O	22. O	32. F	42. F
3. F	13. F	23. O	33. F	43. F
4. F	14. F	24. O	34. O	44. O
5. O	15. F	25. F	35. O	45. O
6. O	16. F	26. F	36. O	46. O
7. F	17. F	27. O	37. F	47. F
8. F	18. O	28. F	38. O	48. O
9. O	19. O	29. O	39. F	
10. O	20. O	30. F	40. F	

(Questions #40 and 43 are "catch" questions. In regard to #40, to prefer a dog to a cat is an opinion but when it is stated (correctly) that one prefers his dog to the cat it is a factual statement. This reasoning also applies to #43.)

UNIT III - WAYS OF OBTAINING FACTUAL INFORMATION

I. Discuss very briefly the four ways of obtaining factual information given in Sections I, II, III, and IV. Then ask the pupils to complete the worksheet carefully. Have them take it home to complete if necessary.

II. Answers to Section II might well be: 5,6,4,2,1,3; 4,6,3,2,5,1; and 5,4,3,2,1.

III. Some answers to Section III might be specific titles of various: Magazines; Newspapers, Encyclopedias; Texts; Research reports; Dictionaries; Teachers; Parents; Community leaders; and Pupils.

IV. Some answers to Section IV might be: Encyclopedias; History Texts; Social Studies Texts; Scholarly Biographies; Autobiographies; Old letters; Old Newspapers, Public documents; People who were participants in the event; and Witnesses including relatives and /or friends.

V. Section V is especially important. Try to call attention to the reasons for their selection.

(Please arrange for Unit IV Section I prior to the next class period.)

UNIT IV - FACTS THAT ARE KNOWN THROUGH YOUR OWN EXPERIENCE

I. The first half of this period might well be used to discuss the pupil's answers to Unit III if they had to take it home to complete the worksheet.

II. For Section I of this Unit - before passing out the worksheets ask the pupils to be especially attentive to the girl who is the come in with an important message. Do not give any indication that they are to be especially conscious of what they see, but only that they should pay close attention. After a one-minute conversation, the girl should leave, and the worksheets can then be passed out. Give them a reasonable length of time to fill out Section I and then discuss. After the discussion, have them fill out the paragraph beginning, "As a result of this..."

UNIT IV - CONT.

You may want to have them share some of these conclusions.

III. The "Listening Experiment", Section II. Let each row be a "group". Hand a slip of paper on which you've written a "message" to the first person in each row. (the same message to each row) Have the first pupil whisper the message to the next person, and so on, until the person on the end receives the final message. This last person in each row writes down what he or she has heard. Then write their final message on the board and his or her row should copy this in the space provided on the worksheet. Repeat a second time, and a third, if desired.

Suggestions for messages:

First - Madame Noskowsky hysterically witnessed the asphixiation of her precious feline friend.

Second- The formula is 3 parts cyanide, 1 part hydrochloric acid, 1 part absinthe, and 1 part animosity.

Third - The assignment is to outline page 1287, memorize the first three major sections and bring in three green frogs.

IV. The "conclusion" to Section II and Section III could be done at home, if there isn't enough time in class, and discussed at the beginning of the next period.

UNIT V - FACTS ACCEPTED ON THE BASIS OF SOME AUTHORITY AND HISTORICAL FACTS

I. After discussing the conclusion to Unit IV, Section II and Section III, pass out the worksheets for Unit V and have them complete in class in about ten minutes and then correct and discuss. (Try to be acceptant of honest differences when they are soundly based.)

II. Section I's answers might be: 8, 5 or 6, 7, 3, 4, 2, 5, or 6, 1.

UNIT V - CONT.

III. Section II's answers might be: 7,8,6,3,4, or 5, 1 or 2, and 1 or 2.

IV. Section III's answers might be:

Magazines - 3, 1, 6, 2, 4 or 5, 4 or 5.
Newspapers - 3, 5, 2, 6, 1, 4.
Encyclopedias - 4, 2, 3, 5, 1.
Dictionaries - 2, 5, 4, 1, 3.

UNIT VI - HISTORICAL TALES THAT MAY OR MAY NOT BE TRUE AND UNTRUTHS OR OPINIONS MASQUERADING AS FACTS

I. Some of the distinctions made in this unit are often subtle, but nevertheless seem to be very important. Prior to leading the discussion concerning the kinds of statements called for in Section I and II, please develop a list of your own statements that would satisfy I and II.

II. Ask the pupils to work for about 5 minutes on Section I and 5 on Section II. At the end of this time, discuss the Sections. Share examples, and encourage pupils to write down the ones they think appropriate if they were not able to develop the 16 examples on their own.

III. Some examples for Section I might be:

1. Daniel Boone felt that the land was over-crowded when the neighbors "closed in" within 25 miles of his home.
2. Some of the details of Paul Revere's ride may or may not be true.
3. Washington threw a silver dollar across the Delaware River.
4. Priscilla said, "Speak for yourself, John Alden!"
5. Some of the Crusaders were searching for the "Holy Grail."
6. Lincoln was his town's best wrestler.
7. Columbus believed he could get to the East by sailing West.

UNIT VI - CONT.

IV. Section II examples might be:

1. Gypsies can foretell the future.
2. Wealth invariably brings happiness.
3. Might makes right.
4. The end justifies the means.
5. If millions of people believe it, it can't be wrong.
6. No one understands teen-agers!
7. He's gone, but I'll never love anyone else!

V. Encourage the pupils to be candid in Section III and discuss only if they care to do so.

UNIT VII - TEST

I. Go over the "Classification of Facts" with the pupils.

II. Have them take the test. Encourage them to separate the pages if it will aid reference to the "classification."

III. After all but two or three have finished, correct, discuss freely, and share results as to number right, standing in class, etc., if this is needed to increase interest and motivation in the "Fact and Opinion Unit".

IV. Suggested Key for the Test-

1. a	9. e	17. d	25. e	33. e
2. e	10. a	18. c	26. a	34. b
3. b	11. d	19. a	27. a	35. e
4. c	12. b	20. e	28. b	36. e
5. d	13. b	21. b	29. d	37. e
6. b	14. e	22. b	30. b	38. e
7. c	15. e	23. a	31. e	39. d
8. b	16. c	24. c	32. a	40. b

Possible controversial statements:

2. Norsemen landed on what is now Nova Scotia prior to Columbus.
9. There were many airplanes before the Wright Brothers'.

UNIT VII - CONT.

15. It appears to do so due to our rotating earth.
19. All one needs is a powerful receiver (radio) and turn it on.
33. The stars are always in place. Daylight makes them undistinguishable.
34. Not having tried it, we accept it on authority.
38. Others, especially in France, were aware of electricity and some of its power prior to Benjamin Franklin's experiments.

UNIT VIII - OPINIONS

I. Introduction - Briefly allude to what has been dealt with in the previous lessons. The next six units will relate to opinions including a classification of opinions into - expert, respected, accepted, subjective (personal), and doubtful. The considerations involved in these units might well have more direct and significant benefits than the previous units.

II. Strive for understanding of and interaction with the definition of an opinion. Relate to each of the four parts of the definition and illustrate each part.

III. Section II, "The Importance of Opinions" should allow for whatever degree of emphasis you would like to give. Discuss and amplify A, B, C, and D. Part C should be especially interesting to the pupils.

IV. Go over the directions for A, B, and C of section III. Give them, or have them give, an example for each and then allow them to complete this section on their own. This work will be evaluated when you go over the completed folder at the end of the instructional period.

UNIT IX - EXPERT AND RESPECTED OPINIONS

I. In regard to sections I and II, help each pupil become thoroughly familiar with the distinction that is being made between an expert and a respected opinion.

For example, with regard to battle strategy, a commanding general would be capable of giving an expert opinion while a major's or a captain's opinion would be considered a respected opinion.

Develop the answers asked for in section I and II with the pupils. They may all record the same answers, if desired, or they may select answers from the discussion if there are many suggestions given.

II. Go over the directions for section III and then allow the class time for the completion. When most everyone has finished, check and discuss the responses.

A suggested key is (Here, as in other sections, the particular answer is not as important as the development of an awareness of the distinctions and practice in making these distinctions.):

	Expert	Respected
1.	Big-League Manager	Little-League Coach
2.	Senator	City Councilman
3.	Store Manager	Dept. Manager
4.	Supreme Court Justice	Lawyer
5.	Minister	Sunday School Teacher
6.	Architect	Draftsman
7.	Surgeon	General Practicioner
8.	Engineer	Foreman
9.	Astronaut	High-Altitude Pilot
10.	World Record Holder	Track Coach
11.	Marriage Counselor	Psychologist
12.	University Professor	High School Teacher
13.	Midget	Jockey
14.	Hotel Chef	Cook
15.	The Inventor	Mechanic

UNIT X - ACCEPTED OPINIONS

I. Emphasize the definition of an accepted opinion.

Familiarize yourself with Section I with a view to developing your own illustrations of accepted opinions, including alternate or opposite opinions that are also widely held.

Relate other cultural and traditional behavior to its basis in accepted opinions. This section would provide an excellent oportunity to briefly discuss other equally valid ways of behaving as indicated in Ruth Benedict's Patterns of Culture or Margaret Mead's Coming of Age in Samoa, etc.

II. Assign Section II to be done in the remainder of class time and to be completed as homework.

UNIT XI - SUBJECTIVE (PERSONAL) AND DOUBTFUL OPINIONS

I. Relate to definition of a subjective or personal opinion.

Discuss and have the pupils give several examples of this kind of an opinion. They might use, for their five, any that are developed during the class discussion.

II. This Section (II) can be quite important.

After clarifying the definition, read the section with them and discuss and illustrate the points as you go along. Note expecially the key words that indicate that the particular opinion is overstated.

Strive for full interaction and amplification here.

The written portion of Section II should be started in class and completed as homework.

UNIT XII - EVALUATING VARIOUS OPINIONS

I. Sections I and II have been designed to allow for a treatment of some points that will, hopefully, change some of the pupils' convictions and attitudes regarding opinions.

Please read, react, and discuss with the pupils; supporting the various points as much as possible.

Suggest that the pupils memorize the five criteria (TEADO), training, experience, achievement, dependability and objectivity, and to use them as often as possible in the evaluation of opinions.

Though section II is a little "preachy", try to ameliorate this factor and still get the points across to the pupils. Hopefully, the "intellectual honest" appeal will aid in getting a hearing for this section.

II. Section III is a practice exercise in elementary application of the TEADO evaluation to various proponents of opinions.

Have the pupils do this section in class or at home, as you prefer. The checking of their responses and the ensuing discussion should allow for the reiteration of TEADO's application to opinion evaluation.

Preferred responses are:

A. 5 (the person involved frequently has the poorest vantage point to see the whole scene .) 4, 1, 3, and 2.
B. 4, 5, 1, 2, and 3.
C. 5 or 6, 5 or 6, 3, 1, 2, and 4.
D. 3, 4, 2, 1, 5 or 6, 5 or 6.
E. 3, 2, 1, 4, 5, 3, and 6.
(E is especially weak and other answers should be equally valid as long as there is some legitimate basis for the distinctions that are being made.)

UNIT XIII - PRACTICE IN EVALUATING VARIOUS OPINIONS

Review the classifications of opinions developed in Units VIII - XI, rather briefly, and have the pupils take this unit as a test. When almost all have finished, check responses and try to help them see the reasoning behind the suggested answers.

1. b	9. e	17. d	25. d	33. b
2. c	10. c	18. e	26. a	34. e
3. a	11. d	19. a	27. c or b	35. b
4. d	12. a or b	20. d	28. a	36. b
5. d	13. b	21. d	29. c or d	37. a
6. d	14. a	22. b	30 e.	38. d
7. a or b	15. d	23. e	31. d	39. b
8. e	16. e	24. d	32. b	40. d

UNIT XIV - REVIEW

This class period should be spent in review in making any additional emphases that you feel are pertinent.

The pupil worksheets are a means of focusing thought sequentially through the various lessons. Use all or a part of them as you see fit, and in any way that you feel will be helpful.

These suggestions are not meant to imply that this isn't a very important aspect of the Fact and Opinion Unit, but to emphasize that broad latitude is available for the accomplishment of the review.

UNIT XV - TEST

This test may be used as a part of the comparative study between the experimental and the control classes so please exercise as much care as possible to insure that the number right obtained by each pupil is accurate.

So that the class may discuss its responses and yet avoid score contamination, please follow this routine. (or one that will accomplish the same purpose) By doing so, we will also provide uniformity throughout the classes.

UNIT XV - CONT.

1. Protect against the comparing of answers during the taking of the test. (This is especially important on T-F tests, as you well know.)

2. Wait for everyone to complete the test.

3. Exchange papers and correct without discussion.

4. Again exchange papers and check the original corrections.

5. Call the class roll and record the number right obtained by each pupil. (Before returning the papers to the rightful owner.)

6. Return the papers to their owners and discuss the answers about which there is a question.

The pupil list indicating the respective scores on this test will be collected with the answer sheets of the second sitting of the Watson-Glaser Critical Thinking Appraisal.

As you know, and as has been indicated frequently throughout this study unit, there is very, very little that is not open to discussion and/or dispute. This is certainly true of this test and the answers that are indicated below. However, this test was constructed, in the light of this study unit, with the idea that the answers given below are appropriate for the questions as they are phrased.

1. T
2. T - If the decisions relating to culture were demanded by the facts of human nature it would seem reasonable to expect a high degree of uniformity among all intelligent peoples. The existing divergency is due to a large measure to the fact that cultural matters are opinions enjoying deep, widespread support from the particular cultural groups.
3. F - The key word here, of course, is "always". An exception might be - In a highly critical situation, the decision as to whether or not to operate must be made by an experienced specialist.

UNIT XV - CONT.

Though the decision will be based on all the available facts, this decision will, in the final analysis, be an expression of his judgment or opinion.

4. T - (see #2)
5. F - The Wright Brothers conducted one of the first successful flights, but there were numerous airplanes before theirs.
6. T - Historical facts, scientific facts, etc.
7. F - All decisions, though noting as many relevant facts as possible, contain an element of opinion.
8. F - "Authorities agree" - Do they/ What authorities? Not all of them certainly.
9. T - Knowledgeable people reject the idea of "luck" and would also reject the superstitions connected with that kind of thinking.
10. F - An example of careless speech that results in the unthinking person accepting the statement as relating to reality. The stars are always there in the sky. The sun's light makes their remote light imperceptible in the daytime.
11. F - If the evidence is probable, it is still an opinion.
12. F - It is a source of widely-collected and highly-refined opinion as to what is preferred by educated, informed people.
13. T - (see #2)
14. T - Most scientific facts are of this nature.
15. F - Scientists tell us that measuring devices do not yield exact information. The more precise the instrument, the more nearly exact the measurement, - but it is never exact.
16. F - "Red" is a term of consensus. There is no absolute, universal example of what the color "red" really is.
17. F - This is a prevelant opinion, but it has yet to be established as a fact.
18. T - The "merely" was put in in order to get a few answers of F.
19. F - A gossip's story usually contains some facts, but seldom to the degree characterized by the Encyclopedia Britannica.
20. F - Pure hogwash! e.g., a successful stockbroker and an illiterate bum could both have an opinion on how to invest $1,000,000.
21. F - There are more millions of people who would prefer their own native land of China, Russia, England, France, etc.

UNIT XV - CONT.

22. F - "No one" is too strong a term. Edgar Friedenberg might, and I would imagine some teen-agers might also.
23. T - (see #2)
24. F - Too sweeping a statement. It would probably be more correct to say, "Some can be trusted and some can't be."
25. T - "Beautiful" is a term indicating a judgment or an opinion.
26. T - e.g. "The Ride of Paul Revere" gives many details that are often accepted as fact although information from other sources concerning his ride is far less precise.
27. T - Webster's Third New International Dictionary.
28. T - If you accurately report what you experienced through your senses, for example.
29. F - Opinion not fact.
30. F - (see #3 as an example of an acceptable opinion - expert really.)
31. F - Compare the robes of Japan, loin cloths of Africa, etc.
32. F - His opinions are those of an expert only when the opinion expressed relates to his field of specialty.
33. F - 1200 years ago millions of people believed the earth to be quite flat. (we are told)
34. F - The key word is "invent".
35. F - A gentleman from Thialand would fold his hands and bow. "Always" is too strong.
36. T - What is his training, experience, achievement, dependability, and objectivity with regard to the subject of the opinion?
37. F - Several cultures of the world have not found this opinion to be a "fact of nature". If some catastrophe would deciminate the male population and leave only one man for every ten or twelve women, polygamy would suddenly become a very desirable rule of behavior.
38. F - A wise person would take serious notice of those established values, but would not accept them just because they were old. His actions should be based on values that he has judiciously established for himself, atking all factors into consideration.
39. T - Expert, respected, accepted, personal, and doubtful.
40. T - We place great confidence in what the doctor prescribes, but it's something that he judges to be needed. There is no absolute assurance that it will be the right medicine. Fortunately, their respected and expert opinions are in most cases exactly what is needed.

APPENDIX B

PUPIL WORKSHEETS FOR FACT AND OPINION UNIT

UNIT I

I. List five instances when it would be very important to know whether a statement was a fact or an opinion.

1. _____

_____

2. _____

_____

3. _____

4. _____

5. _____

II. Definition of a Fact. Please memorize this definition.

Fact: "A term applied to: (1) an occurence, quality, or relation which is manifest in experience or may be inferred with a high degree of certainty; (2) something which has been verified; and (3) something personally known through an awareness of physical actuality or practical experience." (Webster's Third New International Dictionary. p.813.)

Write ten statements which, according to the above definition, are statements of fact.

1. _____

2. _____

3. _____

4. _____

5. _____

UNIT I - CONT.

6. _____

7. _____

8. _____

9. _____

10. _____

III. Definition of an Opinion. Please memorize this definition.

Opinion: "A statement that is not demonstrable as fact and refers to a view, judgment, or appraisal formed in the mind about a particular matter including: (1) a notion or conviction founded on probable evidence; (2) a belief or view based on interpretation of observed facts and experience; (3) something that is generally accepted as factual; and (4) a formal expression by an expert." (Webster's Third New International Dictionary.p. 1582.)

Write ten statements which, according to the above definition, are statements of opinion.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

UNIT II - TEST

Read the following statements and decide whether each statement is a Fact or an Opinion. If you think that the statement is a fact, write F on the line in front of the statement. If you think it is an opinion, write O on the line. Work carefully, but as rapidly as possible.

1._____Ice cream is the best dessert.

2._____She is my sister.

3._____Without water, we would die.

4._____There are seven days in a week.

5._____My teacher is the best teacher in the school.

6._____Spelling is the most important subject that we can study.

7._____Most adults are stronger than children.

8._____San Francisco is California's second largest city.

9._____Television does more harm than good.

10._____California is the finest place to live in the United States.

11._____There is life on other planets.

12._____Kennedy was our greatest President.

13._____Monday comes after Sunday.

14._____Lincoln freed the slaves with his "Emancipation Proclamation".

15._____I just weighed myself and I weigh 135 pounds.

16._____Steel is harder than wood.

17._____Steam escapes from the surface of boiling water.

18._____A dog is a man's best friend.

20._____Boys have more fun than girls do.

UNIT II - TEST CONT.

21._____A carrot is a vegetable.

22._____This medicine should help you get well.

23._____Basketball is America's most exciting spectator sport.

24._____It is great to be a teen-ager!

25._____There are sixteen ounces in a pound.

26._____Raindrops moisten or wet whatever they drop on.

27._____Sweet is more pleasant than sour.

28._____A baby duck is called a duckling.

29._____Blue is prettier than green.

30._____A horse is larger than a pig.

31._____Most adult males are larger than most adult females.

32._____Much information is gotten through reading.

33._____Saturn is one of the planets in our Solar System.

34._____That is a very beautiful picture.

35._____That seems to be a good job of reporting.

36._____Potatoes have a better flavor than turnips.

37._____A horse can run faster than a man.

38._____It's fun to live in our town.

39._____Much of the earth's surface is covered by water.

40._____He likes his dog more than he likes his cat.

UNIT II - TEST CONT.

41._____My Mother is the world's best mother.

42._____People are smarter than bears.

43._____Her favorite car is a Pontiac Grand Prix.

44._____He seems happier than he was before he took his vacation.

45._____Women are smarter than men are.

46._____Dogs make better pets than cats.

47._____Two-year-old children have a lot to learn.

48._____Addition is more important than subtraction.

UNIT III WAYS OF OBTAINING FACTUAL INFORMATION

I. Factual Information can be obtained through direct sensory experience. List two facts you know through the use of each of the following senses.

Sight: 1._____

2._____

Hearing: 1._____

2._____

Feeling: 1._____

2._____

Smelling: 1._____

2._____

Tasting: 1._____

2._____

II. Factual information can also be obtained through the use of various kinds of measurement devices. Below are listed some objects to be measured. Decide which instrument of measurement will give you the most precise or the most accurate information and put a 1 in the blank. Select the next most exact and put a 2 in the blank in front of that method of measurement, etc.

To find the weight of a young boy...

_____Lift him
_____Make a judgment by sight
_____Have three people lift him and take an average of their three estimates.
_____Use a bathroom scale
_____Use the scales in a doctor's office
_____Put him on a see-saw and balance his weight with that of a boy whose weight you already know - one on one end and one on the other end.

UNIT III CONT.

To find the width of a house...

_____Measure your normal stride and then pace off the distance.
_____Look at the distance and make a very careful estimate.
_____Use a yardstick.
_____Use a ten-foot ruler (a carpenter's ruler)
_____ Have three people estimate the width and take an average of the three estimates.
_____Use a 100-foot tape measure and ask someone to hold one end (carefully).

To find the amount of oil in a partially-filled gallon can...

_____Lift it
_____Lift it and slosh the oil to get an idea as to how full the container is.
_____Weigh it and compare the weight with the weight of a gallon can full of the same kind of oil.
_____Pour the contents into a quart measuring cup.
_____Pour the contents into a gallon measuring container.

III. Many of the facts that we relate to in our daily lives are accepted as facts on the basis of some authority. List at least ten sources of factual information that we accept as fact on the basis of the expertise or authority of others.

1._____

2._____

3._____

4._____

5._____

6._____

7._____

8._____

UNIT III CONT.

9. _____

10. _____

IV. For factual information that relates to the past, we are completely dependent upon reliable sources of information. List ten sources of historical information that can be depended upon with a high degree of certainty.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

V. Which method of arriving at factual information do you think is the most accurate, dependable, or reliable? Indicate your choice of I, II, III, or IV and defend your selection in a paragraph or so. Try to make three or four pertinent points in your justification.

The best way to arrive at factual information is___.

_____

_____

_____

_____

UNIT IV - FACTS THAT ARE KNOWN THROUGH YOUR OWN EXPERIENCE

I. Visual Experiment. Please answer the following questions.

Was her hair red, brown, black or blonde?_____

What color were her shoes?_____

Did she have on a skirt and blouse or a dress?_____

Was she wearing a sweater?_____

Did she have on any make-up?_____If so, what kind?

_____

Was she taller, shorter, or about the same height as the teacher?_____

Which word best describes her attitude toward the teacher? Friendly, Sullen, Courteous, Withdrawn, Resentful, Helpful, Cooperative, Anxious, Nervous, or Relaxed.

_____

As a result of this little experiment, what would you conclude with regard to "eye-witness" facts?

_____

_____

_____

II. "But I heard it with my own ears!" A Listening Experiment.

First Trial: Original Message._____

_____

Last Message._____

_____

Second Message.(Original) _____

UNIT IV CONT.

Last Message._____

Third Trial: Original Message._____

Last Message._____

Even though you were trying to be accurate in what you said and especially attentive to what you heard discrepancies did occur. What would you conclude from this with regard to information that is supposed to be factual because it was "heard with my own ears"?

III. An added difficulty with regard to facts that are known through our own experiences is that when we try to report concerning these experiences we can never really be sure that others have the same meaning for the words we use. We can never be certain that they see, hear, feel, taste, or smell exactly what we do.

For example, try to describe what "red" means or is._____

How does "velvet" feel?_____

What does an orange taste like?_____

What does "good" mean?_____

UNIT V - FACTS ACCEPTED ON THE BASIS OF SOME AUTHORITY AND HISTORICAL FACTS

I. The people listed below are giving information on what it's like in outer space. Which of them would more likely be giving factual information? Number them in the order of dependability, acceptability, or level of expertise. (1 first, 2 next, and so on)

_____First grader

_____Ninth grader who likes space science

_____Middle-aged lady

_____Astronomer

_____High school science teacher

_____Astronaut who is in training to go into orbit

_____High school social studies teacher

_____Astronaut who has orbited the earth

II. If you were asked to find out accurate information regarding George Washington, you would want to go to various sources of historical information. Some of these sources are listed below. Please number them in order of their dependability, acceptability, or level of expertise.

_____Fifth-grade social studies text

_____Second-grade reader containing a story about George Washington

_____High school history text

_____Scholarly biography of Washington

_____College history text

_____Popular biography of Washington

_____Article in an historical research journal on the last few years of Washington's life

_____Autobiography of Washington

UNIT V CONT.

III. There are many sources of the kind of information that is accepted as factual on the basis of some authority. Some of these sources are magazines, newspapers, books, encyclopedias, and, of course, the experts themselves. Indicate your judgment concerning those listed in each category by numbering them in the order of their dependability, accuracy, and/or level of expertise.

Magazines:
_____ Look
_____ Harper's
_____ True Romance
_____ Time
_____ Argosy
_____ Good Housekeeping

Newspapers:
_____ San Francisco Chronicle
_____ Local weekly paper
_____ Christian Science Monitor
_____ Daily Worker (Communist daily)
_____ New York Times
_____ Local daily paper

Encyclopedias:
_____ The Golden Book Encyclopedia
_____ World Book
_____ Book of Knowledge
_____ Children's Encyclopedia (Two-volume)
_____ Encyclopedia Britannica

UNIT V CONT.

Dictionaries:

_____ Webster's Seventh New Collegiate Dictionary

_____ My First Dictionary

_____ Elementary Dictionary

_____ Webster's Third New International Dictionary

_____ Dictionary (High school edition)

UNIT VI -- HISTORICAL TALES THAT MAY OR MAY NOT BE TRUE AND UNTRUTHS OR OPINIONS MASQUERADING AS FACTS

I. In the light of today's discussion, please enumerate at least eight historical tales that may or may not be true.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

II. List below eight untruths or opinions masquerading as facts.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

III. Can you identify some opinions of your own that, in practice, you treat as facts?

1. _____
2. _____
3. _____

UNIT VII

PRACTICE IN DIFFERENTIATING AMONG THE KINDS OF FACTS

Using the classification of facts given below, indicate the kind of fact represented by the statement given.

Classification Of Facts

a. Something known to be a fact through your own experience.
b. A statement that is accepted as a fact on the basis of some generally accepted authority or expert.
c. A statement regarding an historical fact.
d. An historical tale that may or may not be true.
e. An untruth or opinion that some people tell or report as being a fact.

1._____When ice melts it becomes water.

2._____Columbus was the first European to discover America.

3._____It is approximately 250,000 miles from the earth to the moon.

4._____George Washington was the first president of the United States.

5._____Sir Walter Raleigh threw his coat on the wet ground for the queen to walk on.

6._____The capital of the U. S. S. R. is Moscow.

7._____Abraham Lincoln was assinated while he was president of the U. S.

8._____The United States of America is made up of fifty separate states.

9._____The Wright Brothers invented the first airplane.

10._____Water is dangerous if it is taken into the nostrils and lungs.

11._____George Washington cut down a cherry tree and admitted it.

UNIT VII - CONT.

12._____The Pilgrims came over on the Mayflower.

13._____The earth revolves about the sun and rotates on its own axis.

14._____It was right that the white man took the land from the Indians because the Indians didn't know how to use it properly anyway.

15._____The sun comes up each day.

16._____Lindberg was the first man to fly alone across the Atlantic non-stop.

17._____Robin Hood robbed the rich and gave to the poor.

18._____The United States began with thirteen states.

19._____There is music is the air almost all of the time, even though we do not always hear it ourselves.

20._____If you can just get enough money, then you will be happy.

21._____The word "desuetude" in this sentence is spelled correctly.

22._____The sun is the center of our Solar System.

23._____A rock is heavier than a feather.

24._____Sitting Bull was a great Indian leader.

25._____All Russians cannot be trusted.

26._____It is generally warmer in the summer than in the winter.

27._____A rock that is thrown into deep water will sink.

28._____Antarctica is located in the vicinity of the South Pole.

29._____King Arthur and his Knights defended the weak from the strong oppressors.

UNIT VII - CONT.

30._____Sir Isaac Newton was a great scientist.

31._____If you break a mirror you will have seven years bad luck.

32._____Electricity is an important source of power.

33._____At night the stars come out.

34._____If we did not eat we would die.

35._____Each person has a good fairy that watches over him or her.

36._____The sun does not give off any light at night.

37._____California is by far the best state in the Union.

38._____Benjamin Franklin discovered electricity for the first time.

39._____Captain John Smith's life was saved by Pocahontas.

40._____An atom is made up of a nucleus and at least one electron.

UNIT VIII - OPINIONS

I. Definition of an Opinion. Please check to see that you are completely familar with this definition.

Opinion: "A statement that is not demonstrable as fact and refers to a view, judgment, or appraisal formed in the mind about a particular matter including: (1) a notion or conviction founded on probable evidence; (2) a belief or view based on interpretation of observed facts and experience; (3) something that is generally accepted as factual; and (4) a formal expression by an expert." (Webster's Third New International Dictionary. p. 1582)

II. The Importance of Opinions.

A. We never reject a statement just because it is an opinion.

"You certainly look nice today", is a welcomed opinion.

B. Much of our conversation is the expression and/or acceptance of various opinions.

"How are you?" "I'm fine!" (an opinion)
"Beautiful day, isn't it?" (an opinion)
"Wasn't that an exciting class we just had?" (an opinion)
"What do you think is going to happen to us?" (requests an opinion)

C. Many of our actions are based on the opinions of others.

e.g. what we wear, how we talk, where we go, what we do, and, in a large measure, what we think.

D. Opinions are the "stuff" out of which culture is developed.

e.g. what constitutes "good manners" is based on respected opinions which, in time, becomes generally accepted and eventually traditional.

UNIT VIII CONT.

III. Key Words that Indicate That a Statement is an Opinion.

A. Imperatives such as should, ought, must, etc., almost invariably involve opinions. Give five examples of opinions that include the imperative.

1. _____

2. _____

3. _____

4. _____

_____

5. _____

_____

B. Comparatives and superlatives also indicate that the statement is an expression of an opinion. List five examples of opinions containing comparatives and five examples of opinions involving the use of superlatives.

1. _____

2. _____

_____

3. _____

_____

4. _____

5. _____

_____

1. _____

_____

UNIT VIII CONT.

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

C. Various adjectives and adverbs are also key indicators of opinions. (i.e. words such as beautiful, nicely, etc.) List some examples below and, in addition, attempt to develop an alertness to their use by others.

Adjectives	Adverbs
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____

UNIT IX - EXPERT AND RESPECTED OPINIONS

I. Expert Opinion: A statement of an opinion with which very few knowledgable people would disagree and with which all other knowledgeable people would agree.

Indicate three individuals whose opinions would be considered expert opinions with regard to a particular area of expertise.

Individual	With Regard To:
1._____	1._____
2._____	2._____
3._____	3._____

II. Respected Opinion: A statement of an opinion with which a few knowledgeable people would disagree but with which all other knowledgeable people would agree.

Indicate three individuals whose opinions would be considered respected opinions with regard to a particular area of specialization or training.

Individual	With Regard To:
1._____	_____
2._____	_____
3._____	_____

III. The left-hand column below indicates the problem or area of discussion about which an opinion is to be expressed. From the list of individuals-by-occupation given on the following page, select the appropriate classification for an opinion expressed by a person having that occupation.

Subject	Expert	Respected
1. How to play baseball	_____	_____
2. On politics	_____	_____

UNIT IX CONT.

	Subject	Expert	Respected
3.	Merchandising	_____	_____
4.	On a court decision	_____	_____
5.	On a religious issue	_____	_____
6.	The design of a building	_____	_____
7.	How to operate	_____	_____
8.	Building construction	_____	_____
9.	On space travel	_____	_____
10.	How to run the mile	_____	_____
11.	On marriage	_____	_____
12.	His field of teaching	_____	_____
13.	What its like to be small	_____	_____
14.	Preparation of a delicacy	_____	_____
15.	Repair of some equipment	_____	_____

Architect High-School Teacher Jockey Cook

Astronaut Little-League Coach Dept. Manager

Lawyer Minister Senator University Professor

Draftsman Foreman Surgeon Marriage-Counselor

World Record Holder Midget Hotel Chef Mechanic

Sunday School Teacher Supreme Court Justice

City Councilman Track Coach Psychologist

Store Manager General Practicioner Engineer

High-Altitude Pilot Big-League Manager The Inventor

UNIT X - GENERALLY ACCEPTED OPINIONS

I. Accepted Opinion: A statement of an opinion with which many people would agree but with which many people would also disagree.

Many of our attitudes and actions are based on opinions of this type.

Some examples of this kind of an opinion.

A. "America is the finest country in the world!"

cf. the viewpoint of a Russian, a German, etc.

B. "Men should wear trousers."

cf. Scottish kilts, Persian pantaloons, India's robes, Ancient Greek and Roman togas, the knee-length pants of the Revolutionary period, etc.

C. "A gentlemen allows a lady to enter a building, room, automobile, etc. first.

df. the brave-squaw relationship in which she often walked while he rode and the Japanese custom of the wife walking behind her husband.

D. "Men should shake hands when greeting one another."

cf. the Eastern custom of folded hands and a slight bow and the Ancient Roman custom of clasping the forearms.

Most of the behavior relating to our particular culture is based on accepted opinions.

II. List ten accepted opinions and alternate or opposite opinions that are also accepted opinions. On line a, give a generally-accepted opinion, and then on line b, give an opposite or alternate opinion on the same subject that is also widely held.

1. a._____

UNIT X CONT.

1. b. _____

2. a. _____

   b. _____

3. a. _____

   b. _____

4. a. _____

   b. _____

5. a. _____

   b. _____

6. a. _____

   b. _____

7. a. _____

   b. _____

8. a. _____

   b. _____

9. a. _____

   b. _____

10. a. _____

    b. _____

UNIT XI - SUBJECTIVE (PERSONAL) AND DOUBTFUL OPINIONS

I. Subjective (Personal) Opinion: A statement of an opinion with which very few people would agree but which knowledgeable people recognize as being of value to the person having this opinion.

For example: "I have the nicest mother in the world!" or "That is the most exciting book I've ever read!"

Give five additional examples of subjective opinions.

1. _____

2. _____

3. _____

4. _____

5. _____

II. Doubtful Opinion: A statement of opinion with which very few knowledgeable people would agree and with which all other knowledgeable people would disagree.

Doubtful opinions are often expressed as if they are facts.

For example: "You never do the right thing!" or
"You're always late!" or
"Nothing exciting ever happens to me!"

Key words that indicate that a statement may be an expression of a doubtful opinion are those that are:

A. Too extreme or inclusive relating to time (always, never, everytime, etc.)

B. Too extreme or inclusive with regard to people (everyone, no one, none, all, etc.)

C. Too extreme or inclusive with regard to things (everything, nothing, none, etc.)

D. Too extreme or inclusive with regard to ideas (definitely, absolutely, positively, etc.)

UNIT XI CONT.

On the following lines, give three examples each for A and B above, and two examples each for C and D.

A. 1.

2.

3.

B. 1.

2.

3.

C. 1.

2.

D. 1.

2.

UNIT XII - EVALUATING VARIOUS OPINIONS

I. Criteria For Evaluating The Quality Of An Opinion

How you view the speaker's qualifications determines your evaluation of the opinion expressed.

A. The amount and quality of the training that the speaker has with regard to the subject about which he is expressing an opinion.(e.g. it is doubtful whether expertise with regard to Atomic Submarines would qualify one as an expert with regard to Education.)

B. How much, and what kind of experience has the speaker had with regard to the subject about which he is expressing an opinion?

C. What level of achievement has the speaker attained in the area that relates to the subject about which he is expressing an opinion?

D. What information do we have relative to the speaker's dependability?

E. How about the degree of objectivity? To what degree does the speaker's involvement color his opinion?

II. In evaluating the significance, character, and worth of an opinion, would not intellectual honesty suggest the following?

A. It would seem that a wise person would attempt to learn as much as possible about the speaker's qualification with regard to the opinion he has expressed before evaluating the opinion he has expressed.

B. It would also seem that the less you know of the speaker's qualifications the less certain you should be concerning your evaluation of the opinion he has expressed.

UNIT XII CONT.

C. Your own opinions would not be made to appear more dependable or authoritative than your qualifications with regard to the particular subject warrant.

D. You would not value your own opinions more than is justified. They would not be more noteworthy because they were your own.

E. Opinions would be evaluated on other grounds than just their degree of general acceptance. "How do knowledgeable people view this question?" or "What is the opinion, in this regard, of knowledgeable people?" are questions one might well ask when evaluating generally accepted or widely-held opinions.

III. In the following exercises, read the paragraphs describing particular incidents. Listed below the paragraphs will be several individuals who would supposedly be expressing an opinion with regard to the incident. Number them, in the blanks provided, 1, 2, 3, ... according to your evaluation of the dependability, objectivity, and general worth of their opinion.

A. In an after-school softball game between ninth-graders from two schools, an important run did not score because the umpire (the coach from the other school) called the runner out at home plate. The boy was on the home team. Evaluate the opinions.

_____The boy who was put? or called out.
_____A ninth grade girl from the other school.
_____The umpire at home plate.
_____One of the players on the home team.
_____The umpire at second base. (the runner's coach)

B. Several people are discussing what is required if one is to be a good soldier, sailor, or marine. Whom would you judge to know most what he or she is talking about?

UNIT XII CONT.

_____The mother of a sailor.
_____A teen-ager about to enlist.
_____A General of the Army.
_____A retired Master Sergeant.
_____A private in the Marines.

C. A small boy lies sick in his bed. Several people have looked at him and have decided what they think is wrong with him and what should be done for him. Evaluate the opinions.

_____An older sister.
_____A neighbor lady, who "had a boy who looked just like that!"
_____A nurse who has been attending the boy for some time.
_____The Specialist called in the Doctor for consultation.
_____The Doctor in charge of the case.
_____The father of the boy.

D. The beauty contest is over. The winner is truly worthy but her selection was not unanimous. Many people are second-guessing the decision. Evaluate their opinions.

_____The Master of Ceremonies.
_____A spectator who had been in the balcony.
_____Owner of a model agency.
_____The winner's mother.
_____The boy friend of one of the losers.

E. A criminal trial has just been completed and the jury has returned its verdict. Because of the importance of the case, many of the people involved and concerned have gathered in a restaurant near the court house to discuss the trail and the verdict. Strong and often opposite opinions are expressed by the following people. Knowing nothing of the case yourself, whose opinion would you be most likely to value most highly?

_____A newspaper reporter.
_____A member of the jury.
_____The presiding judge in the case.
_____The District Attorney (the prosecutor).
_____A witness for the defense.
_____A spectator.
_____The guilty person's mother.

UNIT XIII - PRACTICE IN EVALUATING VARIOUS OPINIONS

Using the classifications developed in Units VIII - XI (a. Expert, b. Respected, c. Accepted, d. Subjective (personal), and e. Doubtful) determine whether each opinion given below should be in the a, b, c, d, or e categoary and put that letter on the blank space in front of the particular opinion.

The word or words in parentheses indicate the person who expressed the opinion. As you know, this is of primary importance in determining the particular classification for any statement of an opinion.

1.___It looks like we will have a real good crop this year. (farmer)

2.___California is a wonderful place to live. (visitor)

3.___Your playing seems to be off key. (symphony director)

4.___Asparagus tastes like weeds. (little boy)

5.___That is the most beautiful sunset I've ever seen. (lady)

6.___My wife is really a wonderful woman. (husband)

7.___You do not seem to be managing your money properly. (financial counselor)

8.___No one cares whether we live or die. (orphan)

9.___Men are certainly no good. (old maid)

10.___People who read a lot make good conversationalists. (man)

11.___No one can be trusted. (man full of hate)

12.___This construction should prove to be quite satisfactory. (civil engineer)

13.___I don't think that this law should have been passed at all. (Congressman)

UNIT XIII CONT.

14.___This is the best way to make a hydrogen bomb. (atomic scientist)

15.___My Mother is prettier than your Mother. (girl)

16.___Children are more trouble than they're worth! (older woman)

17.___Music is my favorite subject. (pupil)

18.___I am the world's greatest painter! (art student)

19.___That large growth should be cut out. (cancer specialist)

20.___Football is an exciting sport to watch. (spectator)

21.___You are nice person to be around. (your best friend)

22.___If you think of others more than you think of yourself, you will probably be liked by them. (mother)

23.___Strength is more important than intelligence.(laborer)

24.___You are the smartest teacher in the whole world. (pupil)

25.___People from England are not as friendly as the Americans are. (Canadian)

26.___If you want to get promotions in the service, you must learn to always follow orders. (general)

27.___Laughter is fine medicine for the soul. (clown)

UNIT XIII CONT.

28.___That's a well-cut, fashionable suit. (fashion consultant)

29.___The Navy is the most important part of our defense. (sailor)

30.___Your future will certainly be better than your past has been. (fortune teller)

31.___This is the finest car that I've ever had. (man)

32.___If you take this medicine, you ought to improve. (doctor)

33.___We are doing the best we can under the circumstances. (President of the U. S.)

34.___Mothers are more important in children's lives than fathers are, always! (mother)

35.___Pupils should follow the instructions of their teachers. (parent)

36.___If you try harder, you'll probably get a raise. (boss)

37.___Those certainly appear to be his fingerprints. (criminologist)

38.___You're the most handsome boy I've ever seen. (girl)

39.___Each one of you will benefit if you will try to read for awhile each evening during the semester. (teacher)

40.___She is the best teacher I ever had. (lady)

UNIT XIV - REVIEW

I. Definition of a Fact. Review the definition and illustrate each part of the definition.

Fact: "A term applied to a statement concerning:

(1)_____;

e.g._____

_____.

(2)_____;

e.g._____

_____.

(3)_____;

e.g._____

_____.

II. Ways of Obtaining Factual Information. (Illustrate each method.)

A. Through sensory experience.

_____

_____

B. Through the use of measurement devices.

_____

_____

C. By attending to an authoritative source of information.

_____

_____

UNIT XIV CONT.

D. By reference to reliable sources of historical information.

_____

_____

III. Untruths or Opinions Masquerading as Facts. (Illustrate)

A. An untruth masquerading as a fact.

1. _____

_____

2. _____

_____

B. Opinions that masquerade as facts.

1. _____

_____

2. _____

_____

IV. Definition of an Opinion. Review the definition and illustrate each part of the definition.

Opinion: "A statement that is not demonstrable as fact and refers to a view, judgment, or appraisal formed in the mind about a particular matter including:

(1) _____;

e.g. _____

_____

UNIT XIV CONT.

(2)_____;

e.g._____

(3)_____;

e.g._____

(4)_____;

e.g._____

V. The Importance of Opinions.

A. Never reject a statement just because it is an opinion.
B. Much of our conversation is the expression and/or acceptance of various opinions.
C. Many of our actions are based on the opinions of ourselves and others.
D. Opinions are the "stuff" out of which culture is developed.

VI. Key Words that Indicate That a Statement is an Opinion.

A. Imperatives

B. Comparatives

C. Various adjectives

D. Other

VII. Questionable or Doubtful Opinions. These opinions often contain words such as: all, never, best, first, everyone, authorities agree, absolutely, always, everything, positively, without a doubt, etc.

VIII. Review the Distinctions Between the Other Kinds of Opinions. (expert, respected, accepted, and subjective or personal)

UNIT XV - TEST

Please read the following statements and determine whether each one is either true or false. If the statement is true, mark a T in the blank provided. If the statement is false, put an F in the blank.

1.___Much, if not most, of our conversation consists of the expression of opinions.

2.___Culture is developed on the basis of opinions.

3.___Facts are always more important than opinions.

4.___Teen-agers have a "way-of-life" of their own that is based on their opinions.

5.___The Wright Brothers invented the first airplane.

6.___There are different kinds of facts.

7.___A wise person acts only on the basis of established facts.

8.___Authorities agree that boys are smarter than girls.

9.___The idea that certain actions may bring bad luck is an opinion.

10.___At night, the stars come out.

11.___A fact is the statement of a conviction founded on probable evidence.

12.___A dictionary is a source of facts with regard to word meaning, etc.

13.___Opinions are the "stuff" out of which culture is developed.

14.___Many facts have to be accepted on the basis of the authority of others.

15.___When you use an accurate measuring device you arrive at exact information.

UNIT XV CONT.

16.___The term "red" used to describe a particular color, means the same thing to all intelligent people.

17.___It is a fact that television does more harm than good.

18.___A formal expression by an expert may be merely an opinion.

19.___All sources of factual information are equally dependable.

20.___"One Man's opinion is as good as another Man's opinion."

21.___It is generally-accepted fact that "America is the finest country in the world".

22.___No one really understands teen-agers.

23.___Most of the behavior relating to our particular culture is based on accepted opinions.

24.___The Russian people cannot be trusted.

25.___A statement that indicates that something is beautiful will always be a statement of an opinion.

26.___Some historical information may be nothing but frequently repeated opinion.

27.___A fact is a statement concerning an occurrence, quality, or relation which may be inferred with a high degree of certainty.

28.___You can be a source of factual information.

29.___"A dog is a man's best friend" is a widely recognized fact.

30.___When an intelligent, educated person finally determines that a statement is just an opinion, he will probably reject it.

UNIT XV CONT.

31.___"Men should wear trousers" is an obvious rule of life.

32.___The opinions of a highly-trained, experienced, and respected scientist would always be the opinions of an expert.

33.___If millions of people believe it to be true, it can't be wrong.

34.___Benjamin Franklin was the first American to invent electricity.

35.___A well-behaved man always shakes hands when being introduced to a stranger.

36.___In deciding on the value of an opinion, one must know who stated the opinion.

37.___That a man should have but one wife, is a fact of nature.

38.___An individual should base his actions and choices on values which have been established by others over a long period of time.

39.___There are different kinds of opinions.

40.___A doctor's prescription of medicine, correct dosage, and time schedule is the expression of an opinion.

AUTOBIOGRAPHICAL STATEMENT

NAME: Dale Eugene Lee Fisher

BIRTH: January 2, 1923, Maplewood, Missouri, U.S.A.

EDUCATION: Elementary school, Rock Hill, Missouri; Secondary school, Webster Groves, Missouri. Colleges: Wheaton College, Wheaton, Illinois; Denison University, Granville, Ohio; Baylor University, Waco, Texas; A.B., 1947; Fuller Theological Seminary, Pasadena, California; B.D., 1950; University of the Pacific, Stockton, California; M.A., 1959; University of California, Berkeley, California; University of the Pacific, Stockton, California; Ed.D., 1968.

POSITIONS: Assistant Minister, Park Street Congregational Church, Boston, Massachusetts, 1950-1951. Minister, Ganado Baptist Church, Ganado, Texas, 1951-1952. Salesman, Liberty Mutual Insurance Company, Houston, Texas, 1952. Salesman, United Mutual Fund, Houston, Texas, 1952. Sales Manager, Swanson Real Estate Company, Victoria, Texas, 1952-1953. Construction Welder, Union Carbide Polyethelene Plant Construction, Seadrift, Texas, 1953-1954. Teacher of grades five and six, Bruella Union School District, Acampo, California, 1955-1956. Teacher of grade five, Stockton Unified School District, Stockton, California, 1956-1959. Teacher of the educationally handicapped, Santa Rosa City Schools, Santa Rosa, California, 1959-1962. Vice Principal and Teacher of grade four, Santa Rosa City Schools, Santa Rosa, California, 1962-1965. Principal, Santa Rosa City Schools, Santa Rosa, California, 1965-1967. Assistant Director, Laura Ann Sisk Memorial Reading Clinic, University of the Pacific, Stockton, California, 1967-1968.

MEMBERSHIPS: Member, California Elementary School Administrators; National Education Association; California Teachers Association; Santa Rosa Teachers Association; Commonwealth Club; Phi Delta Kappa; and Phi Kappa Phi.

MILITARY SERVICE: United States Army Air Force, 1943-1945.